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Two Essays on Institutional Investors and U.S. Bank Holding Companies

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TWO ESSAYS ON INSTITUTIONAL INVESTORS AND U.S. BANK HOLDING COMPANIES

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Abstract

This dissertation studies institutional investment in U.S. bank holding companies (BHCs). The first essay examines institutional investing preferences in U.S. banks and the impact of expansion of bank power on the preferences. Institutional investors prefer BHCs that hold more liquid assets, are better capitalized and larger in size, have better loan quality, lower stock return volatility and less derivative trading. In addition, the expansion of bank power is welcomed by various types of institutional investors, except for long-term institutions. Institutional investors also become less risk-averse when investing in BHCs that have expanded into non-banking business. However, the increased complexity and opaqueness of banks makes it harder for institutional investors to implement informative tradings, though grey and long-term institutions are less adversely affected than independent and short-term institutions.

The second essay focuses on the 2008 financial crisis and investigates the under-researched area "the role of institutional investors in financial industry during crisis time". It provides evidence that grey institutions (i.e. banks and insurance companies) have more information about banks' risk exposure to securitization than do independent institutions (e.g. investment companies and public pension funds) as they shy away from banks with high risk exposure to securitization market, such as BHCs that hold more private-label MBS or BHCs that issue riskier securitization deals before the crisis. In addition, the trading of grey institutions before the crisis can also predict high-exposure banks' abnormal returns around the Lehman Bankruptcy and is related to such banks' operating performance during the crisis period.

Chapter 1. The Impact of Gramm-Leach-Bliley Act: Evidence from Institutional Investment in U.S. Banks

1.1 Introduction

Institutional investors have emerged as significant players in the capital market. They discipline managers either directly through proxy proposals and private negotiations (Song and Szewczyk (2003)) or indirectly through trading (Edmans and Manso (2011) and Chang, Lin, and Ma (2014)). Many studies have looked into the investment preferences of institutional investors and have found evidence that institutional investors prefer to make "prudent investments". For example, Del Guercio (1996) shows that many institutional investors tilt their portfolios to stocks that are viewed as prudent investments. Bushee and Noe (2000) suggest that institutional investors prefer firms with better disclosure rankings to reduce monitoring costs. Gompers and Metrick (2001) find that institutional investors prefer stocks of larger companies. Grinstein and Michaely (2005) suggest that institutions avoid firms that do not pay dividends, because a "prudent" stock should have a history of stable dividend payments. Giannetti and Simonov (2006) show that both foreign and domestic financial institutions are reluctant to hold shares of companies that have high control to cash flow rights ratios of principal shareholders. Falkenstein (1996) and Huang (2009) show that mutual funds prefer stocks with higher market liquidity.

This bulging literature, however, to our best knowledge, does not include institutional investors' preferences on another group of influential market participants—bank holding companies (BHCs). In this study, we fill this gap by examining which bank characteristics attract institutional investing. We find that when investing in BHCs, institutional investors still follow a "prudent investment" strategy as they prefer to invest in BHCs that hold more liquid assets, are better capitalized, are larger in size, have better loan quality, and have lower stock return volatility and lower activities in derivative trading.

We then analyze the changes of institutional investors' preferences surrounding the passage of the Gramm-Leach-Bliley Act (GLB Act). The GLB Act is one of the most significant changes in banking regulation. It partially repeals the Glass-Steagall Act, which prohibited commercial banks from engaging in investment banking and insurance business (Kroszner and Rajan (1994)). The massive expansion of banking power allows bank holding companies to bundle services and swap information across different divisions, which can reduce information production costs and enhance banking services to client firms (Kanatas and Qi (2003) and Yasuda (2005)). However, the potential for conflicts of interests also arises (Kroszner and Rajan (1997) and Song (2004)). For example, with the new granted securities underwriting power, it is possible for banks to assist firms that are in the brink of default to issue public securities and raise money to repay loans. Information obtained from lending and underwriting can also be channeled to the asset management divisions to gain trading advantages (see, for example, Acharya and Johnson (2007) and Massa and Rehman (2008)). Banks no longer only operate as lenders, many become financial conglomerates with complex business activities, which also make banks less transparent and difficult to monitor.

Although the GLB Act has created sweeping changes in the financial services industry, systematic evaluation of its impacts on banks as a whole is scarce.[1] In this paper, we fill the gap by investigating the effect from the perspective of institutional investors. The changes of their investment preferences and their abilities to predict bank performance can shed light on the effects of this important Act. Our sample of bank holding companies starts from 1986 Q3 as it's the first quarter the FR Y9-C data is available on WRDS and our sample ends in 2013 Q4.

[1] Most of studies in this area focus on one or two business lines, such as combine lending, underwriting, or asset management, and information spillover to different divisions. The analysis also tends to investigate the effects on borrowers and/or securities issuers.

We entertain two possible hypotheses. Allowing banks to explore new activities can increase banks' revenue sources and the diversification across business lines can potentially smooth earnings and make the banks safer. Prudent institutional investors would prefer such changes and increase holdings, which we tested as the expansion hypothesis. However, the expansion of bank power can also make it harder to monitor and value banks due to the complexity of financial conglomerates. There are great concerns that banks may take advantage of deposit insurance and too big to fail by taking excessive risk. Following the financial crisis, market participants have questioned whether the expansion of bank power have led to weaker lending standards, increased risk-taking behavior, and contributed to losses faced by the financial sector.[2] This opaqueness and concerns for risk-taking can discourage institutional investing, which we label as the opaqueness hypothesis.

Note that these two hypotheses are not necessarily mutually exclusive and can coexist because banks have multiple dimensions and can be very different. Each dimension can attract and discourage institutional investments, thus we analyze the effects not only through the changes of intercepts across time, but also through the changes of coefficients on various bank characteristics. To further examine the opaqueness of banks, we analyze institutional investors' ability to predict bank performance through their trading.

To implement our analysis, it is necessary to recognize that the repeal of the Glass-Steagall Act indeed occurred gradually over time. For example, the Federal Reserve Board allowed some commercial banks to engage in limited underwriting of debt securities in 1987 up to 5% of the revenues of their Section 20 subsidiaries. The subsidiaries are named "Section 20" because it is

[2] See, for example, "The financial crisis: walls come down, reviving fears of a falling titan," Wall Street Journal, September 23, 2008.

the ruling in the Glass-Steagall Act related to restrictions on non-bank activities. In 1989, underwriting powers were expanded to include both debt and equity and the revenue limitation was raised to 10% which was further revised to 25% in 1996 (Shivdasani and Song, 2011).[3] Basically, banks had to submit individual applications to acquire the power to engage in non-bank activities since 1987. Therefore, not all banks have started the expansion at the same time, but gradually throughout the 1990s. Therefore, we classify the banks into two groups—the early movers, who have engaged in non-banking activities by setting up Section 20 subsidiaries prior to the enactment of GLB, and the late adopters, who have become Financial Holding Companies (FHCs) and started to do business in non-banking areas after the enactment of GLB. For the easy of distinguishing these two types of banks, we call the early mover, Section 20 banks, and the rest of banks, FHC banks. The Section 20 banks are analyzed based on their individual application approval dates, while the FHC banks are analyzed based on the dates they are designated as Financial Holding Companies after the enactment of GLBA.

Our results suggest the institutional investors welcome the expansion of bank power in general, and the positive effect is more profound for the early movers. In addition, following the expansion of banking power, institutional investors become less responsive to the BHCs' risk characteristics. Again, the relaxation on the risk features is more significant for the early movers. Specifically, institutional investors are less concerned about liquidity, equity ratio, size and profitability when investing in Section 20 banks while they also loosen their requirement on size and loan quality for FHC banks. In addition, we find some evidence that the increased complexity

[3] For the initial rulings, see J.P Morgan & Co. Inc., The Chase Manhattan Corp., Bankers Trust New York Corp., Citicorp, and Security Pacific Corp., Federal Reserve Bulletin 75 (1989): 192-217. See also Federal Register 61 (1996), pages 68750-68756 for revenue limitation changes and tests.

in BHCs after expansion of bank power makes it more difficult for institutions to implement informative trades in these BHCs.

We further analyze investment preferences by different types of institutional investors. First we separate institutions into grey institutions and independent institutions following Chen, Harford, and Li (2007) based on whether the institutions have potential business relationship with the banks they invest. Secondly, we separate institutions into short-term institutions and long-term institutions following Gaspar, Massa, and Matos (2005) based on the institutions' investment horizons. Our results indicate all but long-term institutions have increased their holding in BHCs to some extent with the expansion of bank power. Grey institutions increase their investment in early movers as these BHCs set up Section 20 subsidiaries while independent and short-term institutions respond positively to both establishment of Section 20 subsidiaries and designation of FHCs. Though different institutions relax restrictions on different risk characteristics, they all become less risk-averse after the expansion of bank power.

We further investigate whether the trading of different types of institutional investors can predict subsequent bank performance. When we look at the predictive power of institutional trading on BHCs' future stock performance, we find that though the trading of short-term institutions is least informative relative to the trading of other institutions, the informativeness of tradings of all institutions is adversely affected by the expansion of bank power. When we look at operating performance, we find that informativeness of tradings is not adversely affected for grey and long-term institutions, but it is adversely affected for independent and short-term institutions.

Overall, our analysis demonstrate that the first moves in expansion of bank power are welcomed among institutional investors. The opaqueness of banks do not seem to discourage much institutional investing. However, the preferences vary among different types of institutions. Grey

and long-term institutions appear to prefer banks that expand more conservatively. Their trades also have slightly stronger predictive power of subsequent bank performance than independent and short-term institutional investors.

This paper contributes to the literature in institutional investors and more generally in the financial institution area. It sheds light on the effect of the GLB Act and provides implications of this important regulation change. Our evidence shows that this Act significantly affects the composition of institutional investors among U.S. banks. The remainder of this paper is organized as follows. Section 1.2 describes the data and variables. Section 1.3 reports the results on general relationship and 1.4 reports the results on the expansion of bank power. Section 1.5 concludes.

1.2 Data, Variables and Descriptive Statistics

In this section, we discuss sample construction, variable definitions and summary statistics for key variables.

1.2.1 Data sources

Our sample starts from 1986 Q3 as it's the first quarter the FR Y9-C data is available on WRDS; and our sample ends in 2013 Q4. We get stock return information from CRSP daily stock file. We collect institutional holding data from Thomson-Reuters Institutional Holdings (13f) Database. Institutional investors that use United States mail in their business and exercise investment discretion over $100 million are required to file Form 13F with SEC pursuant to Section 13(f) of the Securities Exchange Act of 1934. Form 13F filings provides information regarding the securities holdings of institutional investors. Exceptions are small positions that include fewer than 10,000 shares of a given issuer and the aggregate fair market value of the same position is less than $200,000. The commonly used databases for institutional holdings are the Thomson Financial sets

that are also known as CDA/Spectrum 13f database. The Thomson sets are available on WRDS as part of the Thomson Financial Network (TFN).

One issue with TFN 13f data is there are serious classification errors in recent years. Many banks (TYPECODE=1) and Independent Investment Advisors (TYPECODE=4) are misclassified as others (TYPECODE=5) in 1998 and beyond[4]. Previous studies usually correct this problem by replacing a manager's TYPECODE after 1998 with the TYPECODE reported before 1998[5]. After further investigating the data, we find that misclassification can happen to institutions whose post-1998 TYPECODE is not 5 as well. For example, Brown Brothers Harriman & CO had a TYPECODE of "5" up to June 30, 1998 after which its TYPECODE was recorded as "1"; or Epoch Investment Partners, Inc. whose TYPECODE changed from "5" before September 30, 2008 to "4" afterwards. To fully address this issue, we replace an institution's later date TYPECODE with its earliest date TYPECODE. Because the MGRNO identifiers are reused in TFN 13(f), we assign a new unique identifier to each include institution based on its MGRNAME, MGRNO, and RDATE in TFN. Whenever in doubt, we double check the institution's information on EDGAR and the institution's website (if a website is available). Then we further confine our sample to institutions that have ever invested in BHCs. We merge BHCs and their institutional investors using CUSIP.

1.2.2 Institutional ownership and types

Thomson Financial Spectrum classifies institutions into five types: 1) banks; 2) insurance companies; 3) investment companies and their managers; 4) independent investment advisers; and 5) others (pension funds, endowments, etc.). Following Chen, Harford, and Li (2007), we classify types 3 and 4 as well as public pension funds[6] from type 5 as independent institutions; and types

[4] "WRDS Overview of Thomson Reuters Mutual Fund and Investment Company Data".
[5] For example, Ivashina and Sun (2011).
[6] A list of public pension funds is provided in the appendix.

1 and 2 as grey institutions[7]. Total institutional ownership (IO_Total) is calculated as the ratio of a BHC's total shares held by 13f investors over the BHC's total shares outstanding. Total institutional ownership from grey institutions (IO_Grey) is computed as the percentage of shares held by grey institutions; total institutional ownership from independent institutions (IO_Indp) is computed as the percentage of shares held by independent institutions.

We also classify institutional investors into short-term and long-term investors based on their trading behaviors: short-term institutions should trade more frequently than long-term institutions. Following Gaspar, Massa, and Matos (2005) and Cella, Ellul and Mariassunta (2013), we estimate an institution's churn ratio holding an investment portfolio of firms denoted as I by the following equation,

$$CR_{GMM,k,t} = \frac{\sum_{i \in \mathrm{I}} \left| N_{k,i,t} P_{i,t} - N_{k,i,t-1} P_{i,t-1} - N_{k,i,t} \Delta P_{i,t} \right|}{\sum_{i \in \mathrm{I}} \frac{N_{k,i,t} P_{i,t} + N_{k,i,t-1} P_{i,t-1}}{2}} \qquad (1.1)$$

where $N_{k,i,t}$ and $P_{i,t}$ are the number of shares and price of stock i held by institution k in quarter t. The value of the churn ratio ranges from 0 to 2. The higher the value, the more frequently an institution buy and sell shares.

After obtaining churn ratio for institution k in quarter t, we calculate each institution's average churn rate over the past four quarters as:

$$AVG\_CR_{GMM,k,t} = \frac{1}{4} \sum_{j=0}^{3} CR_{k,t-j} \qquad (1.2)$$

Each quarter, we sort all institutions into three tertile portfolios based on average churn rates. The institutions that rank in the top tertile (with highest $AVG\_CR_{k,t}$) are classified as short-

[7] In Chen, Harford, and Li (2007), they classify banks, insurance companies and all non-public pension funds from type 5 as grey institutions; for our purpose, we include only banks and insurance companies as grey institutions.

term institutional investors and institutions that rank in the bottom tertile are classified as long-term institutions. Long-term institutional ownership (short-term institutional ownership) is the holding of all long-term institutions (all short-term institutions) over the firm's number of shares outstanding.

1.2.3 BHC characteristics and stock performance

We obtain consolidated financial information of bank holding companies (BHCs) from the FR Y-9C reports from the Federal Reserve Bank of Chicago (FRB Chicago). Following Peria and Schumkler (2001), and Hadad, Agusman, Monroe, Gasbarro and Zumwalt (2011), we construct measures for various BHC characteristics:

(1) Liquidity risk. We measure a BHC's balance sheet liquidity by the ratio of liquid assets over total assets (LIQ).

(2) Credit risk or loan quality. We compute the sum of loans past due 90 days or more and loans not accruing for bad loans, scaled by total assets (LQLT).

(3) Capital adequacy. We use total equity capital over total assets (EQT).

(4) Profitability. We use return on assets (PRF).

(5) Efficiency. We use the ratio of noninterest expenditures to total assets (EFF).

Following Ellul and Yerramilli (2013), we also collect the following measures for our sample BHCs:

(6) Reliance on off-balance-sheet activity. We use the ratio of noninterest income over total net income.

(7) Time-varying risk preferences. We use BHC's derivative trading over assets (DT) and BHC's derivate hedging over assets (DH).

We also include the logarithm of BHC assets (Size) as total assets has been shown to be a proxy for bank diversification potential (Brewer, 1989). Larger banks may also be redeemed safer by investors due to "too big to fail". All BHC characteristic measures but Size are in percentage. In addition, we also include two BHC stock performance measure. QRET is for compounded stock return over the quarter using BHCs' daily return data; QVOL is quarterly return volatility, calculated as the variance of daily returns over the quarter.

1.2.4 Descriptive statistics for BHC characteristics

We provide summary statistics for major BHC characteristic measures in Table 1.1. In Panel A of Table 1.1, we present the descriptive statistics for all sample BHCs. We provide mean, median, standard deviation, 25^{th} percentile and 75^{th} percentile for each variable. Along with each variable, we also provide the number of BHC-quarters that has available information to compute the statistic. The mean and median for BHC size are fairly close, indicating that our size measure is fairly symmetric after taking the logarithm of the book value of asset. An average BHC holds around 25% liquid assets, enjoys 0.5% return on assets, and holds around 8.8% of assets in equity capital.

On average, BHCs spend 2% of assets on noninterest expense. Nonperforming loans, estimated by the sum of loans over 90 days late and loans not accruing, take up around 0.77% for an average BHC. The distribution of derivatives used for trading and hedging are highly skewed indicating that not every BHC is equally active in using derivatives. Average quarterly return for sample BHCs is 3.3% with a mean standard deviation of 0.09.

Table 1.1 Summary Statistics

Panel A. Summary Statistics for the whole sample						
Variable	Mean	Median	Std Dev	P25	P75	N
BHC Risk Characteristics						
Size	14.424	14.081	1.601	13.264	15.280	40541
LIQ	24.833	23.599	11.380	16.744	31.290	40541
PRF	0.512	0.521	0.695	0.265	0.849	40541
EQT	8.857	8.517	2.640	7.196	10.062	40541
EFF	2.069	1.894	1.229	1.112	2.726	40541
LQLT	0.774	0.350	1.250	0.100	0.876	40541
DT	13.441	0.000	139.279	0.000	0.000	40541
DH	2.057	0.000	7.583	0.000	0.279	40541
NONINC	15.813	13.281	11.041	8.861	19.564	40541
QRET	3.314	2.527	17.003	-5.331	11.630	40494
QVOL	0.089	0.041	0.184	0.022	0.083	40490
Institutional ownership						
IO_Total	24.259	17.901	21.387	6.664	37.152	40541
IO_Indp	13.661	9.531	13.472	2.739	20.922	40541
IO_Grey	7.974	4.883	8.722	1.302	12.893	40541
IO_ST	3.054	1.385	4.527	0.083	4.253	40541
IO_LT	11.462	8.093	11.076	2.563	17.665	40541

Panel B. Univariate comparison between Non-Section 20 and Section 20 BHCs										
	Non-Section 20 BHCs			Section 20 BHCs					Wilcoxon	
Variable	Mean	Median	N	Mean	Median	N	T-test		test	
BHC Risk Characteristics										
Size	14.149	13.886	17747	17.954	18.022	708	121.807	***	43.376	***
LIQ	27.720	26.337	17747	23.913	22.325	708	-8.519	***	-11.051	***
PRF	0.565	0.561	17747	0.640	0.629	708	4.161	***	3.954	***
EQT	8.414	8.090	17747	7.021	7.161	708	-25.587	***	-16.534	***

(Table 1.1 continued)

	Non-Section 20 BHCs			Section 20 BHCs						
Variable	Mean	Median	N	Mean	Median	N	T-test		Wilcoxon test	
EFF	2.159	1.992	17747	2.181	2.059	708	0.503		1.003	
LQLT	0.420	0.170	17747	0.446	0.222	708	0.850		1.242	
DT	1.792	0.000	17747	144.276	0.033	708	12.754	***	52.162	***
DH	0.181	0.000	17747	2.579	0.000	708	12.414	***	41.692	***
NONINC	12.954	11.389	17747	23.111	22.172	708	32.439	***	32.054	***
QRET	4.390	3.221	17712	5.477	5.953	708	1.926	*	3.284	***
QVOL	0.085	0.043	17710	0.036	0.026	708	-27.584	***	-14.338	***
Institutional ownership										
IO_Total	18.656	13.809	17747	50.124	51.852	708	59.418	***	36.597	***
IO_Indp	10.085	6.496	17747	28.842	29.198	708	42.299	***	34.406	***
IO_Grey	8.068	4.455	17747	20.057	19.954	708	50.768	***	33.383	***
IO_ST	3.027	1.254	17747	6.805	6.034	708	22.960	***	26.987	***
IO_LT	8.480	5.493	17747	22.886	22.383	708	52.885	***	35.746	***

Panel C. Univariate comparison between FHCs and Non-FHCs after GLBA

	Non-FHCs			FHCs						
Variable	Mean	Median	N	Mean	Median	N	T-test		Wilcoxon test	
BHC Risk Characteristics										
Size	14.082	13.861	14979	15.041	14.715	6222	43.058	***	42.727	***
LIQ	22.439	21.164	14979	22.989	20.698	6222	3.219	***	2.052	**
PRF	0.417	0.455	14979	0.557	0.533	6222	13.057	***	11.431	***
EQT	9.122	8.815	14979	9.644	9.228	6222	12.395	***	12.649	***
EFF	1.962	1.784	14979	2.029	1.831	6222	3.428	***	2.200	**
LQLT	1.121	0.545	14979	0.940	0.527	6222	-8.943	***	0.157	
DT	0.926	0.000	14979	25.551	0.000	6222	8.662	***	25.644	***
DH	2.134	0.000	14979	4.562	0.513	6222	16.585	***	33.294	***
NONINC	15.133	13.362	14979	21.815	18.901	6222	33.229	***	37.758	***

(Table 1.1 continued)

	Non-FHCs			FHCs						
Variable	Mean	Median	N	Mean	Median	N	T-test		Wilcoxon test	
QRET	2.221	1.698	14967	2.803	2.327	6222	2.267	**	3.074	***
QVOL	0.103	0.042	14965	0.077	0.035	6222	-10.338	***	-11.153	***
Institutional ownership										
IO_Total	23.654	16.875	14979	34.336	29.360	6222	29.905	***	30.392	***
IO_Indp	13.867	9.525	14979	19.406	15.751	6222	24.545	***	25.936	***
IO_Grey	5.995	3.396	14979	9.559	8.267	6222	31.726	***	37.964	***
IO_ST	2.657	0.969	14979	3.461	2.002	6222	12.466	***	21.585	***
IO_LT	11.367	8.194	14979	16.607	14.835	6222	29.424	***	31.267	***

Notes: Panel A presents descriptive statistics for BHC characteristics and institutional ownership. Panel B provides a univariate comparison of BHC characteristics and institutional ownership between non-Section 20 BHCs and Section 20 BHCs before the enactment of Gramm-Leach-Bliley Act (GLBA). Panel C provides a univariate comparison of BHC characteristics and institutional ownership for BHCs that are designated as Financial Holding Companies after the enactment of GLBA. SIZE is natural logarithm of total assets. LIQ measures a BHC's balance sheet liquidity, it's calculated as liquid assets over total assets. PRF is profitability measures, it's calculated as net income over total assets. EQT is equity ratio, calculated as equity capital over total assets. EFF is BHC efficiency measure, it's calculated as noninterest expenses over total assets. LQLT is BHC loan quality measures, it's calculated as the sum of nonperforming and nonaccrual loans over total assets. DT is total gross notional amount of derivative contracts held for trading over total assets. DH is total value of derivatives used for hedging purposes over total assets. NONINC is noninterest income over the sum of interest- and noninterest income. QRET compounded quarterly return using daily data. QVOL is quarterly return volatility, calculated as the variance of daily returns over the quarter. LIQ, PRF, LQLT, EQT, EFF, DT, and DH, and NONINC are in percentages. IO_Total is a BHC's total institutional ownership from all 13f institutions. IO_Indp is a BHC's total institutional ownership from independent institutions; and IO_Grey is a BHC's total institutional ownership from grey institutions. IO_ST is a BHC's total institutional ownership from short-term institutions. IO_LT is a BHC's total institutional ownership from long-term institutions. *** p<0.01, ** p<0.05, * p<0.1.

On average, institutional investors hold 24.3% of sample BHCs' shares. On average, more than 10% of BHCs' shares are held by independent institutions; while around 8% of shares are held by grey institutions. When we separate institutions into short-term and long-term institutions (note that we do not include the institutions whose churn rates fall in the middle tertile by this classification), we see that for an average BHC, its long-term institutional ownership is much higher than short-term institutional ownership.

In Panel B of Table 1.1, we seek to understand the differences in characteristics between BHCs with Section 20 subsidiaries and those without before the enactment of GLBA. We use t-test and Wilcoxon test to investigate difference in means on various BHC characteristics and institutional ownership measures between the two groups. We can see that Section 20 BHCs are larger in size, hold slightly less liquid assets, are more profitable, have relatively lower equity ratio, are more active in derivative trading and hedging, rely more heavily on non-interest income, and have higher stock returns and lower return volatility. In terms of institutional holdings, Section 20 BHCs have much higher proportion of their shares held by institutions; it applies to all types of institutions as well as all institutions as a whole.

The centerpiece created by the GLBA is the Financial Holding Companies (FHCs). BHCs and foreign banks that meet certain criteria can become a FHC. In Panel C of Table 1.1, we investigate whether BHC characteristics and institutional ownership differ between BHCs that are Financial Holding Companies and those that are not. The univariate tests suggest that FHCs are larger in size, hold more liquid assets, enjoy higher profitability, are better capitalized, spend more on non-interest expenses, and have better loan quality. Financial Holding Companies are also more active in using derivatives for trading and hedging purposes, and they generate a higher proportion of their income from non-interest incomes, and they have higher stock returns but lower return

volatility. When we compare the institutional ownership between FHCs and non-FHCs, we also observe that FHCs have higher aggregate institutional ownership than do non-FHCs and the same holds for all different types of institutional investors.

1.3 General Relationship

1.3.1 Total institutional ownership and BHC risk characteristics for the whole sample

We start our regression analysis by investigating whether institutional investors prefer certain BHC characteristics. To do so, we regress aggregate institutional ownership on various BHC characteristics,

$$IO\_Total_{i,t} = \alpha_i + \alpha_t + \beta * X_{i,t-1} + \varepsilon_{i,t} \qquad (1.3)$$

In the above equation, $IO\_Total_{i,t}$ denotes the total institutional ownership for BHC i in quarter t. $X_{i,t-1}$ is a vector of BHC characteristics that may affect its institutional ownership. We also include BHC fixed effects ($\boldsymbol{\alpha_i}$) to control for unobserved heterogeneity across BHCs and time fixed effects ($\boldsymbol{\alpha_t}$) to control for unobserved heterogeneity across different time periods. We cluster standard errors at BHC level to allow for intragroup correlation. The regression results are reported in Table 1.2.

Table 1.2 Institutional ownership and BHC risk characteristics

VARIABLES	(1) Panel	(2) Orthogonal	(3) 2SLS
LIQ_{t-1}	0.076***	0.079***	1.789***
	(0.028)	(0.029)	(0.371)
EQT_{t-1}	1.307***	1.341***	4.014**
	(0.105)	(0.108)	(2.045)
$SIZE_{t-1}$	7.106***	6.836***	54.513***
	(0.902)	(0.921)	(11.951)
PRF_{t-1}	0.296	0.721**	-15.277**
	(0.226)	(0.312)	(6.853)
$LQLT_{t-1}$	-0.400**	-0.351*	0.850

(Table 1.2 continued)

VARIABLES	(1) Panel	(2) Orthogonal	(3) 2SLS
	(0.194)	(0.205)	(2.221)
$QRET_{t-1}$	0.007**	-0.004	0.421*
	(0.003)	(0.003)	(0.252)
$QVOL_{t-1}$	-3.414***	-3.555***	-27.846***
	(0.676)	(0.776)	(10.470)
EFF_{t-1}	0.218	0.481	5.117**
	(0.203)	(0.295)	(2.101)
DT_{t-1}	-0.011***	-0.011***	-0.598***
	(0.001)	(0.001)	(0.121)
DH_{t-1}	-0.054	-0.057	-1.066
	(0.046)	(0.046)	(1.428)
$NONINC_{t-1}$	-0.020	-0.040	-2.274***
	(0.041)	(0.042)	(0.586)
Constant	-98.203***	17.317***	-797.979***
	(12.485)	(1.558)	(163.232)
Observations	39,480	28,886	28,886
# BHCs	1,004	994	994
Adjusted R^2	0.592	0.586	0.121
Time Fixed	Yes	Yes	No
BHC Fixed	Yes	Yes	Yes
F-test bank risk measures	29.78	30.46	
Sargan-Hansen Stat			2.225
P-Value			0.136

Notes: This table provides panel regression results of total institutional ownership on various BHC risk measures. More specifically, we estimate: $IO\_Total_{i,t} = \alpha_i + \alpha_t + \beta * X_{i,t-1} + \varepsilon_{i,t}$.
Total institutional ownership (IO_TOTAL) is calculated as number of shares held by institutions divided by a BHC's total shares outstanding. All dependent variables are defined as in Table 1.1 and are in percentages. LIQ, PRF, LQLT, EQT, EFF, DT, and DH, and NONINC are in percentages. In all regressions, the independent variables are lagged by one period. In Column 1 we use the level of risk measures. In Column 2 we orthogonalize each risk measure to change in institutional ownership and use the orthogonalized risk measure errors in the regression. In Column 3, we use instrumental regression, the instruments chosen for the risk measures are industry average of each risk measure and individual BHCs' deposit-loan difference at time t-2. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different quarters. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

Column 1 shows that institutional ownership is positively correlated BHCs' balance sheet liquidity, capital equity ratio and size and stock returns. At the same time, institutional investors

appear avoid BHCs with worse loan quality, higher stock return volatility and active derivative trading. And the F-test shows that BHC risk measures are jointly significant in explaining institutional ownership level. The results are consistent with the argument that institutional investors' fiduciary responsibilities give them a strong incentive to choose stocks that are deemed as "prudent investment".

1.3.2 Endogeneity concern

Although we postulate that institutional investors prefer low-risk BHCs, the negative relation between institutional ownership and BHC risk measures may be driven by reserve causality (i.e., institutional investor activism causes BHCs to confine their risk-taking activities). We have used lagged BHC risk measures in the regression, which makes it less likely for the causality to run from institutional ownership to bank risk. However, to further address this issue, we first orthogonalize each BHC risk measure by contemporaneous institutional holding changes and use the regression residuals to replace corresponding BHC risk measures.

The result is reported in Column 2 of Table 1.2. The result is quantitatively similar to that in Column 1; the only exception is that BHC profitability is now positive and significant. Secondly, we employ instrumental variable regressions. Admittedly, it is challenging to find valid instrumental variables that predict a BHC's risk characteristic but not its institutional ownership. Nevertheless, we use the industry average of each risk measure and individual BHCs' deposit-loan difference at time t-2 as the instruments for included risk measures; we then replace each risk measure with its predicted value. The second-stage regression result is provided in Column 3 of Table 1.2. Liquidity, equity ratio, size, stock return, return volatility and derivative trading have maintained their signs and significance, though loan quality has lost its significance. In addition, the overidentification tests

cannot reject the null hypothesis that the excluded instruments are valid instruments, i.e., uncorrelated with the error term but is correlated with securitization measures.

1.3.3 Total institutional trading and future BHC performance for the whole sample

In Section 1.3.1 and 1.3.2 we have demonstrated that institutional investors prefer "safer" bank holding companies. In this section, we focus on whether institutional trading can predict BHCs' future performance such as stock performance and operating performance. We examine 6 different performance measures: subsequent quarter abnormal stock returns, one-year buy-and-holding returns, two-year buy-and-hold returns, stock tail risk, and return on asset and loan loss provision. We regress one of the performance measures on institutional trading with BHC fixed effect and date fixed effect. The regressions are of the form

$$Y_{i,t} = \alpha_i + \alpha_t + \beta * \Delta IO\_Total_{i,t-1} + \varepsilon_{i,t} \qquad (1.4)$$

In the above equation $Y_{i,t}$ represents one of the performance measures: $CAR2_{i,t+1}$ for abnormal stock returns for the subsequent quarter using Carhart four factor model, $RET_{1yr}\ and\ RET_{2yr}$ are buy-and-hold return over the next one year and the next two years, respectively, $Tail\ Risk_{i,t+1}$ is the negative of the average return on the BHC's stock during the 5% worst returns days in subsequent quarter, and $ROA_{i,t+1}$ for BHC i's return on assets in the subsequent quarter, LLP_{t+1} is loan loss provision over total assets. $\Delta IO\_Total_{i,t-1}$ represents the change in total institutional ownership. $X_{i,t}$ is a vector of control variables. Regression results are provided in Table 1.3.

The regression results provide strong evidence that institutional trading can predict future BHC performance: institutional trading is positively and significantly related to one-year buy-and-hold returns and future ROA; and it is negatively and significantly related to tail risk and loan loss

provision. The evidence indicates that institutional investors as a whole have information about the BHCs they invest and they are able to pick the ones that will outperform in the future.

Table 1.3 Institutional trading and future BHC performance.

Dep. Var	(1) CAR_t	(2) RET_{1yr}	(3) RET_{2yr}	(4) $Tail\ Risk_t$	(5) ROA_t	(6) LLP_t
ΔIO_Total_{t-1}	0.004	0.001**	0.001	-0.022***	0.005***	-0.002***
	(0.004)	(0.000)	(0.001)	(0.004)	(0.001)	(0.001)
Observations	38,480	34,307	32,406	38,480	38,527	38,527
# BHCs	999	1,000	976	999	999	999
Adjusted R^2	0.015	0.377	0.402	0.438	0.302	0.348
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports panel regression results of BHC performance on institutional trading. CHGIO_TOTAL is the change in total institutional ownership from previous quarter for each BHC. The regressions are of the following form, $Y_{i,t} = \alpha_i + \alpha_t + \beta * \Delta IO_{Total_{i,t-1}} + \varepsilon_{i,t}$.
CAR is quarterly cumulative abnormal returns from Fama-French three factor model. Tail risk measures the size of losses in the extreme left tail of the BHC's return distribution. RET_{1yr} and RET_{2yr} are buy-and-hold return over the next one year and the next two years, respectively. Following Acharya, Pedersen, Philippon and Richardson (2010), tail risk is calculated as the negative of the average return on the BHC's stock during the 5% worst returns days for the BHC's stock over the quarter. Hence, higher value indicates higher tail risk. We use ROA to measure BHC profitability. LLP is loan loss provision over total assets. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different quarters. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

1.4 The Impact of Section 20 Subsidiary and Gramm-Leach-Bliley Act

1.4.1 Total institutional ownership and BHC risk characteristics with the establishment of Section 20 subsidiary and Gramm-Leach-Bliley Act

After the baseline analysis for the whole sample, we now turn our attention to the establishment of Section 20 subsidiary and the enactment of Gramm-Leach-Bliley Act (enacted on November 12, 1999). In 1987, the Federal Reserve permitted banks to establish special Section 20 investment banking subsidiaries engaged in certain "ineligible" securities activities. Not all banks can establish

Section 20 affiliates, and special permission must be received from the Federal Reserve. Despite banks' attempts to circumvent legal restrictions, a separation among commercial banking, investment banking, and insurance effectively remained in existence until 1999 when President Clinton signed the Gramm-Leach-Bliley Act into law. Ever since, BHCs and foreign banks that meet certain criteria can become a FHC and engage in a wider range activities, such as securities underwriting and dealing, insurance agency and underwriting activities, and merchant banking activities. We seek to understand how the expansion of bank power affects institutional investing and whether the impact is the same for the early adopters (i.e. Section 20 banks) and late adopters (i.e. BHCs that are designated as FHCs after the enactment of GLBA). We construct two dummy variables to account for different events: Sec20 is a dummy variable that equals one for BHC-quarters when a BHC has established Section 20 subsidiary and zero otherwise; FHC is a dummy variable that equals one for non-Section 20 BHCs that are designated as Financial Holding Companies after the enactment of GLBA and zero otherwise. To examine the impact of Section 20 subsidiary and the enactment of Gramm-Leach-Bliley Act on institutional investment, we regress institutional ownership on BHC risk measures as well as their interaction terms with the two dummy variables.

Results are provided in Table 1.4. Column 1 reports the regression coefficients on risk measures; Column 2 reports the regression coefficients on risk measures' interaction terms with Sec20; Column 3 reports the regression coefficients on risk measures' interaction terms with FHC. In Column 4, we provide F-test on equality of coefficients on risk measures' interaction terms with Sec20 and FHC. This specification allows us to examine the different impacts Section 20 Subsidiaries and GLB have on BHCs' institutional ownership. The coefficients of Sec20 and FHC as well as the F-test indicate that institutional investors respond actively to expansion of bank power

in general; and such direct positive impact of expansion of bank power is stronger for the Sec20 banks than for FHCs. After examining the coefficients of interaction terms, we also find that institutional investors are willing to take more risk when investing BHCs with expanded power. For example, institutional investors are willing to invest in Section 20 banks with lower liquidity, lower equity ratio, smaller size, lower profitability but higher stock return volatilities; or they are willing to invest in FHCs with smaller size and lower loan quality (they do oppose excessive activities in derivative trading). In addition, the F-tests for the equality of coefficients on interaction terms suggest that the change in institutional investors' willingness to tolerate BHCs' risk is more pronounced for the early adopters.

Table 1.4 Institutional ownership and BHC risk characteristics with the establishment of Section 20 subsidiary and enactment of GLBA

VARIABLES	(1) BHC Char	(2) BHC Char*Sec20	(3) BHC Char*FHC	(4) F-test for BHC Char*Sec20= BHC Char*FHC
LIQ_{t-1}	0.092***	-0.133*	0.005	2.096
	(0.029)	(0.078)	(0.063)	
EQT_{t-1}	1.369***	-0.811*	-0.184	1.737
	(0.118)	(0.444)	(0.231)	
$SIZE_{t-1}$	7.455***	-5.207**	-1.041*	3.883**
	(0.873)	(2.051)	(0.567)	
PRF_{t-1}	0.318	-2.237***	-0.302	5.845***
	(0.215)	(0.681)	(0.497)	
$LQLT_{t-1}$	-0.589***	0.326	1.670***	2.871*
	(0.179)	(0.658)	(0.487)	
$QRET_{t-1}$	0.003	0.015	0.008	0.373
	(0.003)	(0.011)	(0.007)	
$QVOL_{t-1}$	-2.837***	7.245***	0.329	7.737***
	(0.657)	(2.114)	(1.559)	
EFF_{t-1}	0.129	0.394	0.110	0.661
	(0.197)	(0.313)	(0.182)	
DT_{t-1}	-0.002	-0.003	-0.009***	4.337**
	(0.004)	(0.005)	(0.003)	

(Table 1.4 continued)

VARIABLES	(1) BHC Char	(2) BHC Char*Sec20	(3) BHC Char*FHC	(4) F-test for BHC Char*Sec20= BHC Char*FHC
DH_{t-1}	0.031	-0.156**	0.026	6.497**
	(0.053)	(0.070)	(0.072)	
$NONINC_{t-1}$	0.013	-0.039	-0.011	0.0928
	(0.038)	(0.074)	(0.061)	
Constant	-104.374***			
	(12.175)			
Sec20		96.684***		
		(35.216)		
FHC			17.226*	
			(8.809)	
Sec20=FHC				4.894**
Observations	39,480			
Number of BHCs	1,004			
Adjusted R^2	0.607			
Time Fixed	Yes			
BHC Fixed	Yes			

Notes: This table reports the regression of total institutional ownership on BHC risk characteristics and their interactions with Sec20 as well as GLB,

$$IO_{Total_{i,t}} = \alpha_i + \alpha_t + \beta_0 * X_{i,t-1} + \beta_1 * Sec20 * X_{i,t-1} + \beta_2 * FHC * X_{i,t-1} + \gamma_1 * Sec20 + \gamma_2 * FHC + \varepsilon_{i,t}$$

Independent variable is aggregate institutional ownership from all 13f institutions. Sec20 is a dummy variable that equals one for BHC-quarters when a BHC has established Section 20 subsidiary and zero otherwise. FHC is a dummy variable that equals one for non-Section 20 BHCs that are designated as Financial Holding Companies after the enactment of GLBA and zero otherwise. Other variables are defined as in Table 1.1. Column 1 reports the regression coefficients on risk measures; Column 2 reports the regression coefficients on risk measures' interaction terms with Sec20 and Column 3 reports the regression coefficients on risk measures' interaction terms with FHC. In Column 4, we provide F-test on equality of coefficients on risk measures' interaction terms with Sec20 and FHC. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different quarters. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

1.4.2 Total institutional trading and future BHC performance with the establishment of Section 20 subsidiary and Gramm-Leach-Bliley Act

In this section, we would like to know whether the predictive power of institutional trading on future BHC performance is affected by Section 20 subsidiary or GLB. We augment the regressions in Table 1.3 with Section 20 dummy, FHC dummy as well as their interactions with institutional trading. The results are reported in Table 1.5.

The results in Table 1.5 suggest that institutional trading can predict one-year buy-and-hold returns, tails risk, return on assets (ROA) and loan loss provision (LLP) for BHCs without expanded banks power. As the first group of BHCs make attempt to expand into non-banking business, the increased complexity makes it more difficult for institutional investors to direct information-driven trades. Specifically, the institutional trading is positively related to BHCs' tail risk and loan loss provision for Section 20 banks. In addition, expansion of bank power appears to increase both Section 20 and FHC banks' profitability. Also FHCs seem to have lower loan loss provision.

Table 1.5 Institutional trading and future BHC performance with the establishment of Section 20 subsidiary and enactment of GLB

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Var	CAR_{t+1}	RET_{1yr}	RET_{2yr}	$Tail\ Risk_{t+1}$	ROA_{t+1}	LLP_{t+1}
ΔIO_Total_t	0.003	0.112***	0.087	-0.024***	0.005***	-0.003***
	(0.004)	(0.043)	(0.067)	(0.004)	(0.001)	(0.001)
ΔIO_Total_t	0.006	-0.046	0.016	0.040*	-0.005	0.006*
$* Sec20$	(0.009)	(0.128)	(0.158)	(0.021)	(0.004)	(0.003)
ΔIO_Total_t	0.005	-0.161	-0.079	0.006	0.001	0.001
$* FHC$	(0.008)	(0.163)	(0.200)	(0.008)	(0.003)	(0.002)
Sec20	0.035	-8.470**	-16.744**	0.573	0.142**	-0.066
	(0.148)	(3.472)	(6.886)	(0.364)	(0.066)	(0.051)
FHC	-0.089	-2.588	-3.893	-0.150	0.109***	-0.071***
	(0.068)	(1.940)	(3.702)	(0.130)	(0.031)	(0.021)
Constant	0.757***	-4.360**	34.934***	4.229***	0.234***	0.044***

(Table 1.5 continued)

Dep. Var	(1) CAR_{t+1}	(2) RET_{1yr}	(3) RET_{2yr}	(4) $Tail\ Risk_{t+1}$	(5) ROA_{t+1}	(6) LLP_{t+1}
	(0.208)	(1.907)	(4.074)	(0.152)	(0.022)	(0.016)
Observations	38,480	34,307	32,406	38,480	38,527	38,527
# BHCs	999	1,000	976	999	999	999
Adjusted R^2	0.015	0.404	0.427	0.439	0.303	0.349
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes

Notes: this table provides the regression results of future BHC performance on aggregate institutional trading, its interaction with Sec20, its interaction with GLB, its interaction with Sec20, and FHC. Sec20 is a dummy variable that equals one for BHC-quarters when a BHC has established Section 20 subsidiary and zero otherwise FHC is a dummy variable that equals one for non-Section 20 BHCs that are designated as Financial Holding Companies after the enactment of GLBA and zero otherwise. CAR is quarterly cumulative abnormal returns from Fama-French three factor model. Tail risk measures the size of losses in the extreme left tail of the BHC's return distribution. $RET_{1yr}\ and\ RET_{2yr}$ are buy-and-hold return over the next one year and the next two years, respectively. Following Acharya, Pedersen, Philippon and Richardson (2010), tail risk is calculated as the negative of the average return on the BHC's stock during the 5% worst returns days for the BHC's stock over the quarter. Hence, higher value indicates higher tail risk. We use ROA to measure BHC profitability. LLP is loan loss provision over total assets. Other variables are defined as in Table 2. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different quarters. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

1.4.3 Institutional ownership and BHC risk characteristics with the establishment of Section 20 subsidiary and Gramm-Leach-Bliley Act for different types of institutions

In this section, we separate institutions into sub-groups using two different classifications. First, we separate institutions into independent and grey institutions based on whether they potentially have business ties with the BHCs they invest. Brickely, Lease, and Smith (1988) argue that some institutional investors (e.g., banks and insurance companies) might have existing or potential business relationships with the companies they invest. Here we follow Chen, Harford, and Li (2007) to classify banks and insurance companies as grey institutions, and investment companies,

independent investment advisors as well as public pension funds as independent institutions[8]. Second, we separate institutions into short-term and long-term institutions based on their trading behaviors. A short-term institutional investor would buy and sell its investments more frequently, while a long-term institutional investor would hold its positions unchanged for a considerable length of time. We follow Gaspar, Massa, and Matos (2005) and Cella, Ellul and Mariassunta (2013) and calculate for each institutional investor a measure of how frequently its position on all the stocks in its portfolio is turned over (churn rate) then we rank each institution based on the average of its churn rates in the past four quarters. Institutions whose average churn rates fall in the top tercile are denoted as short-term institutions and institutions whose average churn rates fall in the bottom tercile are denoted as long-term institutions. We run the following regressions for different groups of institutions and report results in Table 1.6.

$$IO\_INS_{k,i,t} = \alpha_i + \alpha_t + \beta_0 * X_{i,t-1} + \beta_1 * Sec20 * X_{i,t-1} + \beta_2 * FHC * X_{i,t-1} + \gamma_1 * Sec20 + \gamma_2 * FHC + \varepsilon_{i,t} \quad (1.5)$$

where $IO\_INS_{k,i,t}$ represents one of the following four institutional ownership measures: IO_Indp, IO_Grey, IO_ST and IO_LT. We provide the results for IO_Indp in Panel A, results for IO_Grey in Panel B, results for IO_ST in Panel C and results for IO_LT in Panel D. Sec20 is a dummy variable that equals one for BHC-quarters when a BHC has established Section 20 subsidiary and zero otherwise. FHC is a dummy variable that equals one for non-Section 20 BHCs that are designated as Financial Holding Companies after the enactment of GLBA and zero otherwise.

[8] Chen, Harford, and Li (2007) also include institutions with a typecode of 5 (other than public pension funds) in 13f as grey institutions; we only include banks and insurance companies here.

Table 1.6 Institutional ownership and BHC risk characteristics with the establishment of Section 20 subsidiary and GLB for different types of institutions.

Panel A. Independent institutions				
	(1)	(2)	(3)	(4)
VARIABLES	BHC Char	BHC Char*Sec20	BHC Char*GLB	F-test for BHC Char*Sec20= BHC Char*GLB
LIQ_{t-1}	0.050**	-0.068	-0.019	0.388
	(0.020)	(0.069)	(0.043)	
EQT_{t-1}	0.904***	-0.332	-0.156	0.123
	(0.085)	(0.484)	(0.173)	
$SIZE_{t-1}$	4.020***	-3.181*	-1.090***	1.408
	(0.688)	(1.728)	(0.408)	
PRF_{t-1}	0.100	-2.282***	-0.120	6.589**
	(0.164)	(0.760)	(0.415)	
$LQLT_{t-1}$	-0.345**	0.056	1.153***	2.346
	(0.137)	(0.624)	(0.390)	
$QRET_{t-1}$	0.003	0.020*	0.007	1.117
	(0.002)	(0.012)	(0.006)	
$QVOL_{t-1}$	-1.973***	4.442***	-2.151	10.32***
	(0.452)	(1.550)	(1.517)	
EFF_{t-1}	0.006	0.616**	0.019	3.442*
	(0.147)	(0.296)	(0.144)	
DT_{t-1}	-0.000	-0.004	-0.008***	2.084
	(0.003)	(0.004)	(0.003)	
DH_{t-1}	0.005	-0.084	0.023	4.439**
	(0.040)	(0.055)	(0.050)	
$NONINC_{t-1}$	0.007	-0.015	0.018	0.153
	(0.028)	(0.074)	(0.042)	
Constant	-59.274***			
	(9.533)			
Sec20		56.215*		
		(29.256)		
FHC			17.400***	
			(6.166)	
Sec20=FHC				1.717
Observations	39,480			
Adjusted R^2	0.502			
Number of BHCs	1,004			
Time Fixed	Yes			
BHC Fixed	Yes			

(Table 1.6 continued)

Panel B. Grey institutions

VARIABLES	(1) BHC Char	(2) BHC Char*Sec20	(3) BHC Char*GLB	(4) F-test for BHC Char*Sec20= BHC Char*GLB
LIQ_{t-1}	0.014	-0.067	0.006	1.835
	(0.013)	(0.047)	(0.029)	
EQT_{t-1}	0.174***	-0.646***	0.005	7.129***
	(0.043)	(0.232)	(0.095)	
$SIZE_{t-1}$	2.839***	-2.193***	-0.250	6.304**
	(0.337)	(0.748)	(0.223)	
PRF_{t-1}	0.333***	-0.119	0.177	0.284
	(0.090)	(0.530)	(0.196)	
$LQLT_{t-1}$	-0.143**	-0.878***	-0.231	4.088**
	(0.068)	(0.287)	(0.159)	
$QRET_{t-1}$	-0.001	-0.003	0.002	0.679
	(0.001)	(0.006)	(0.003)	
$QVOL_{t-1}$	-0.378	0.022	2.609***	5.366**
	(0.253)	(0.890)	(0.793)	
EFF_{t-1}	0.176**	0.015	0.015	0.000
	(0.089)	(0.130)	(0.090)	
DT_{t-1}	-0.002	0.002	-0.002*	7.135***
	(0.001)	(0.001)	(0.001)	
DH_{t-1}	0.009	-0.054**	0.006	6.163**
	(0.022)	(0.026)	(0.029)	
$NONINC_{t-1}$	0.008	-0.061*	-0.024	0.597
	(0.016)	(0.037)	(0.038)	
Constant	-35.055***			
	(4.517)			
Sec20		46.565***		
		(13.033)		
FHC			4.562	
			(3.534)	
Sec20=FHC				9.859***
Observations	39,480			
Adjusted R^2	0.213			
Number of BHCs	1,004			
Time Fixed	Yes			
BHC Fixed	Yes			

(Table 1.6 continued)

Panel C. Short-term institutions

VARIABLES	(1) BHC Char	(2) BHC Char*Sec20	(3) BHC Char*GLB	(4) F-test for BHC Char*Sec20= BHC Char*GLB
LIQ_{t-1}	0.029***	-0.032	0.000	1.084
	(0.008)	(0.028)	(0.016)	
EQT_{t-1}	0.197***	0.419**	-0.130**	6.891***
	(0.031)	(0.204)	(0.059)	
$SIZE_{t-1}$	0.381*	-1.688***	-0.442***	6.519**
	(0.212)	(0.469)	(0.138)	
PRF_{t-1}	-0.018	-0.220	-0.039	0.207
	(0.111)	(0.359)	(0.223)	
$LQLT_{t-1}$	0.043	0.294	0.579**	0.728
	(0.069)	(0.222)	(0.264)	
$QRET_{t-1}$	0.008***	-0.007	0.001	0.418
	(0.001)	(0.012)	(0.003)	
$QVOL_{t-1}$	-0.795***	2.309**	0.731	1.568
	(0.238)	(1.105)	(0.721)	
EFF_{t-1}	0.202***	-0.095	-0.037	0.184
	(0.071)	(0.127)	(0.059)	
DT_{t-1}	-0.001	0.001	-0.001	6.835***
	(0.002)	(0.002)	(0.001)	
DH_{t-1}	0.000	-0.018	0.012	4.50888
	(0.014)	(0.017)	(0.016)	
$NONINC_{t-1}$	-0.025**	-0.145**	0.005	6.674***
	(0.011)	(0.057)	(0.014)	
Constant	-6.743**			
	(2.884)			
Sec20		29.043***		
		(8.563)		
FHC			6.846***	
			(2.186)	
Sec20=FHC				6.361**
Observations	39,480			
Adjusted R^2	0.132			
Number of BHCs	1,004			
Time Fixed	Yes			
BHC Fixed	Yes			

(Table 1.6 continued)

Panel D. Long-term institutions

VARIABLES	(1) BHC Char	(2) BHC Char*Sec20	(3) BHC Char*GLB	(4) F-test for BHC Char*Sec20= BHC Char*GLB
LIQ_{t-1}	0.014	0.085*	0.012	1.669
	(0.015)	(0.050)	(0.029)	
EQT_{t-1}	0.507***	-0.924***	0.146	26.55***
	(0.061)	(0.190)	(0.120)	
$SIZE_{t-1}$	3.719***	-1.465	-0.525*	0.816
	(0.405)	(1.010)	(0.292)	
PRF_{t-1}	-0.088	-0.538	-0.200	0.437
	(0.127)	(0.473)	(0.239)	
$LQLT_{t-1}$	-0.401***	-0.011	0.138	0.140
	(0.090)	(0.303)	(0.286)	
$QRET_{t-1}$	-0.003	0.006	0.001	0.539
	(0.002)	(0.006)	(0.004)	
$QVOL_{t-1}$	-0.354	-1.970	0.119	1.606
	(0.328)	(1.370)	(1.043)	
EFF_{t-1}	-0.038	-0.057	0.001	0.104
	(0.121)	(0.165)	(0.096)	
DT_{t-1}	-0.005***	0.002*	0.001	1.722
	(0.001)	(0.001)	(0.001)	
DH_{t-1}	-0.009	-0.047	0.036	4.192**
	(0.023)	(0.041)	(0.030)	
$NONINC_{t-1}$	0.030	0.042	-0.004	0.399
	(0.024)	(0.071)	(0.031)	
Constant	-51.431***			
	(5.497)			
Sec20		28.641		
		(17.524)		
FHC			6.963	
			(4.474)	
Sec20=FHC				1.475

(Table 1.6 continued)

VARIABLES	(1) BHC Char	(2) BHC Char*Sec20	(3) BHC Char*GLB	(4) F-test for BHC Char*Sec20= BHC Char*GLB
Observations	39,480			
Adjusted R^2	0.502			
Number of BHCs	1,004			
Time Fixed	Yes			
BHC Fixed	Yes			

Notes: this table repeats the regression in the above table for different institution types.

$$IO\_INS_{k,i,t} = \alpha_i + \alpha_t + \beta_0 * X_{i,t-1} + \beta_1 * Sec20 * X_{i,t-1} + \beta_2 * FHC * X_{i,t-1} + \gamma_1 * Sec20 + \gamma_2 * FHC + \varepsilon_{i,t}$$

$IO\_INS_{k,i,t}$ represents one of the following four institutional ownership measures: IO_Indp, IO_Grey, IO_ST and IO_LT. We provide the results for IO_Indp in Panel A, results for IO_Grey in Panel B, results for IO_ST in Panel C and results for IO_LT in Panel D. Sec20 is a dummy variable that equals one for BHC-quarters when a BHC has established Section 20 subsidiary and zero otherwise. FHC is a dummy variable that equals one for non-Section 20 BHCs that are designated as Financial Holding Companies after the enactment of GLBA and zero otherwise. Other variables are defined as in Table 1.1. Column 1 reports the regression coefficients on risk measures; Column 2 reports the regression coefficients on risk measures' interaction terms with Sec20 and Column 3 reports the regression coefficients on risk measures' interaction terms with FHC. In Column 4, we provide F-test on equality of coefficients on risk measures' interaction terms with Sec20 and FHC. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different quarters. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

In Panel A, we examine the impact of expansion of bank power on independent institutional ownership. From the positive and significant coefficients of Sec20 and FHC, we can see that independent institutions welcome expansion of bank power. Furthermore, the F-test fails to reject that independent institutions treat early adopters and late adopters differently. When we look at the coefficients of interaction terms, we see that independent institutions become less risk-averse when investing in Section 20 BHCs and FHCs, though they do react to different bank characteristics differently with Section 20 than to FHCs. The only risk-taking activities independent institutions oppose for FHCs is using derivative for tradings.

In Panel B, we move on to grey institutions. The coefficients on the two dummies and F-test indicate that only Section 20 banks that attempt to expand bank power early attract more grey institution investment. Grey institutions are willing to put up with Section 20 BHCs with lower equity ratio, smaller size and less use of derivative for hedging purpose; and FHCs with higher stock return volatilities. However, they still oppose using of derivatives for tradings among FHCs.

In Panel C, we investigate the ownership of short-term institutions. Both the first attempt to expand into non-traditional banking business and industry wide deregulation attract more short-term institutional ownership, though the incremental effect is more pronounced for the early adopters. When investing in Section 20 banks, short-term institutions appear to prefer BHCs that are better capitalized and/or less dependent on non-interest income; at the same time they relaxed their requirement on bank size and stock return volatility. When investing in FHCs, they become even more aggressive in that they are willing to hold FHCs with lower capital ratio, smaller size, and lower-quality loans.

Lastly, we investigate the impact of expansion of bank power on long-term institutional ownership in Panel D. Neither the early attempts to expand bank power nor the industry-wide deregulation appears to be able to attract more long-term institutional ownership directly. In addition, long-term institutions seem to require additional liquidity when investing in Section 20 BHCs though smaller size or derivative trading seem to become more acceptable to long-term institutions. When investing in FHCs, the only change is the relaxed requirement on size.

In summary, all types of institutions but long-term institutors welcome expansion of bank power, may it be the early strategy of establishing Section 20 subsidiaries or later attempt to become financial holding companies. In addition, all types of institutions relax their restrictions on certain

bank risk taking/characteristics to some level for BHCs with expansion into non-traditional banking business, i.e. Section 20 banks and FHCs.

1.4.4 Institutional trading and future BHC performance with the establishment of Section 20 subsidiary and Gramm-Leach-Bliley Act for different institutions

In this section we investigate whether trading behaviors of different institutions have different predicting power and whether they are affected by Section 20 or GLB. We first examine how expansion of bank power affects the predicting power of institutional trading on banks' stock performance. We regress different stock performance measures on institutional trading and its interactions with different dummies and report the results in Table 1.7.

In Panel A, we look at independent and grey institutions. The trading of independent institutions can predict one-year buy-and-hold stock returns as well as tail risk for BHCs without non-trading banking business. In addition, the trading of independent institutions has even incremental power in predicting one-year and two-year returns for Section 20 banks. However, the predicting power in tail risk is compromised with Section 20 banks. The trading of grey institutions can predict one-year and two-return returns as well as stock tail risk for BHCs without expanded power. But the predicting power in one-year return is negatively affected by establishment of Section 20 subsidiaries though grey institutions seem to be able to better predict future abnormal returns for Section 20 and FHC banks. In Panel B, we turn to short-term and long-term institutions. The trading of short-term institutions appears only able to predict one-year return for FHCs. The trading of long-term institutions can predict one-year, two-year returns and stock tail risk for BHCs without expanded power, but such predicting power is reduced by either establishment of Section 20 or the designation of FHCs.

Table 1.7 Institutional trading and BHC future performance with the establishment of Section 20 subsidiary and GLB

Panel A. Independent and grey institutions								
	(1) CAR_{t+1}	(2) RET_{1yr}	(3) RET_{2yr}	(4) $Tail\ Risk_{t+1}$	(5) CAR_{t+1}	(6) RET_{1yr}	(7) RET_{2yr}	(8) $Tail\ Risk_{t+1}$
		Independent Institutions				*Grey Institutions*		
$\Delta IO\_INS_{i,t}$	0.005	0.172**	0.020	-0.031***	0.006	0.078*	0.164**	-0.011**
	(0.006)	(0.073)	(0.105)	(0.007)	(0.008)	(0.044)	(0.075)	(0.005)
$\Delta IO\_INS_{i,t}$	-0.010	0.400**	0.552**	0.060*	0.039**	-0.406*	-0.351	0.000
$* Sec20$	(0.017)	(0.191)	(0.276)	(0.031)	(0.017)	(0.229)	(0.307)	(0.009)
$\Delta IO\_INS_{i,t}$	0.002	-0.004	0.050	0.003	0.038**	-0.649**	-0.299	0.024**
$* FHC$	(0.012)	(0.211)	(0.324)	(0.011)	(0.015)	(0.253)	(0.326)	(0.012)
Sec20	0.038	-8.584**	-16.872**	0.569	0.037	-8.507**	-16.762**	0.583
	(0.148)	(3.474)	(6.892)	(0.364)	(0.148)	(3.473)	(6.890)	(0.365)
FHC	-0.087	-2.676	-3.934	-0.148	-0.088	-2.658	-3.924	-0.150
	(0.068)	(1.935)	(3.698)	(0.130)	(0.067)	(1.939)	(3.703)	(0.130)
Constant	0.757***	-4.369**	35.002***	4.222***	0.757***	-4.378**	34.961***	4.210***
	(0.208)	(1.908)	(4.072)	(0.152)	(0.208)	(1.903)	(4.080)	(0.152)
Observations	38,480	34,307	32,406	38,480	38,480	34,307	32,406	38,480
# BHCs	999	1,000	976	999	999	1,000	976	999
Adjusted R^2	0.015	0.404	0.427	0.438	0.015	0.404	0.427	0.437
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Short-term and long-term institutions								
	(1) CAR_{t+1}	(2) RET_{1yr}	(3) RET_{2yr}	(4) $Tail\ Risk_{t+1}$	(5) CAR_{t+1}	(6) RET_{1yr}	(7) RET_{2yr}	(8) $Tail\ Risk_{t+1}$
		Short-term Institutions				*Long-term Institutions*		
$\Delta IO\_INS_{i,t}$	-0.004	0.051	-0.074	-0.007	0.005	0.086*	0.106*	-0.011***
	(0.007)	(0.047)	(0.083)	(0.005)	(0.004)	(0.050)	(0.058)	(0.004)

(Table 1.7 continued)

	(1) CAR_{t+1}	(2) RET_{1yr}	(3) RET_{2yr}	(4) $Tail\ Risk_{t+1}$	(5) CAR_{t+1}	(6) RET_{1yr}	(7) RET_{2yr}	(8) $Tail\ Risk_{t+1}$
$\Delta IO\_INS_{i,t}$	0.010	0.194	0.443	0.001	0.007	-0.113	-0.022	0.025***
$* Sec20$	(0.019)	(0.369)	(0.583)	(0.035)	(0.012)	(0.255)	(0.345)	(0.008)
$\Delta IO\_INS_{i,t}$	-0.010	0.437**	0.423	-0.019	0.015	-0.576***	-0.377*	0.012
$* FHC$	(0.015)	(0.193)	(0.319)	(0.016)	(0.010)	(0.166)	(0.205)	(0.009)
Sec20	0.036	-8.481**	-16.755**	0.582	0.033	-8.474**	-16.761**	0.579
	(0.147)	(3.480)	(6.890)	(0.365)	(0.148)	(3.478)	(6.891)	(0.365)
FHC	-0.085	-2.713	-4.009	-0.148	-0.091	-2.477	-3.843	-0.152
	(0.067)	(1.938)	(3.706)	(0.130)	(0.068)	(1.938)	(3.706)	(0.131)
Constant	0.758***	-4.388**	34.981***	4.203***	0.753***	-4.503**	29.475***	4.218***
	(0.209)	(1.905)	(4.083)	(0.153)	(0.208)	(1.909)	(3.751)	(0.152)
Observations	38,480	34,307	32,406	38,480	38,480	34,307	32,406	38,480
Number of BHCs	999	1,000	976	999	999	1,000	976	999
Adjusted R^2	0.015	0.404	0.427	0.437	0.015	0.404	0.427	0.437
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: this table provides the regression results of future BHC stock performance on institutional trading, its interaction with Sec20, its interaction with GLB, its interaction with Sec20, and GLB, and controls for different types of institutions. Sec20 is a dummy variable that equals one for BHC-quarters when a BHC has established Section 20 subsidiary and zero otherwise. FHC is a dummy variable that equals one for non-Section 20 BHCs that are designated as Financial Holding Companies after the enactment of GLBA and zero otherwise. $RET_{1yr}\ and\ RET_{2yr}$ are buy-and-hold return over the next one year and the next two years, respectively. Following Acharya, Pedersen, Philippon and Richardson (2010), tail risk is calculated as the negative of the average return on the BHC's stock during the 5% worst returns days for the BHC's stock over the quarter. Hence, higher value indicates higher tail risk. Other variables are defined as in Table 1.1. For brevity, coefficients of control variables and constants are not reported in the table. Panel A provides the results for independent and grey institution; Panel B provides the results for short-term and long-term institutions. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different quarters. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

We then examine the relation between institutional trading and BHCs' operating performance for different types of institutions and provide the results in Table 1.8. Grey institutions and long-term institutions seem to perform best when predicting future operating performance among BHCs not expanded into non-banking business as their tradings are positively related to return on assets and negatively related to loan loss provision. Followed by independent institutions, whose trading can predict ROA for non-expanded BHCs. However, the increased opacity associated with expansion of bank power negatively affects the trading performance of independent institutions and short-term institutions. On the other hand, grey institutions and long-term institutions do not perform significantly better when it comes to predicting the operating performance for Section 20 BHCs or FHCs.

1.5 Conclusion

In this essay, we investigate the investment preferences of institutions when investing in U.S. bank holding companies (BHCs) as well as the impacts of expansion of bank power on institutional investing in U.S. banking industry to shed lights on the roles of institutional investors in the financial services industry. We first establish that when investing in BHCs, institutions still follow a "prudent" investment strategy as they invest more in BHCs that hold more liquid assets, are better capitalized and larger in size, hold better quality loans, have lower stock return volatility and engage less in derivative tradings. We then investigate changes in institutional investors' investment preferences in response to two particular events – the establishment of Section 20 subsidiaries and the enactment of GLBA. Our results suggest that in general institutional investors welcome the expansion of bank power into non-bank activities, it's especially so for the early adopters. The positive relation between institutional ownership and expansion in bank power holds for all types of institutions but long-term institutions.

Table 1.8 Institutional trading and BHC fundamentals with the establishment of Section 20 subsidiary and GLB for different types of institutions

VARIABLES	(1) ROA_{t+1}	(2) LLP_{t+1}	(3) ROA_{t+1}	(4) LLP_{t+1}	(5) ROA_{t+1}	(6) LLP_{t+1}	(7) ROA_{t+1}	(8) LLP_{t+1}
	Independent Institutions		*Grey Institutions*		*Short-term Institutions*		*Long-term Institutions*	
$\Delta IO\_INS_{i,t}$	0.005**	-0.003	0.004***	-0.002*	-0.003	0.002	0.004***	-0.002***
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
$\Delta IO\_INS_{i,t}$	-0.011*	0.011**	0.000	-0.000	-0.007	0.008*	0.002	-0.003
$* Sec20$	(0.007)	(0.005)	(0.004)	(0.003)	(0.005)	(0.004)	(0.004)	(0.002)
$\Delta IO\_INS_{i,t}$	-0.002	0.005	0.006	-0.002	0.001	0.002	0.004	-0.003
$* FHC$	(0.005)	(0.003)	(0.004)	(0.003)	(0.005)	(0.003)	(0.003)	(0.002)
Sec20	0.143**	-0.067	0.140**	-0.064	0.140**	-0.064	0.139**	-0.063
	(0.066)	(0.051)	(0.066)	(0.051)	(0.066)	(0.051)	(0.066)	(0.051)
FHC	0.110***	-0.071***	0.110***	-0.070***	0.110***	-0.070***	0.108***	-0.069***
	(0.031)	(0.021)	(0.031)	(0.021)	(0.031)	(0.021)	(0.031)	(0.021)
Constant	0.236***	0.043***	0.237***	0.043***	0.237***	0.043***	0.233***	0.044***
	(0.022)	(0.016)	(0.022)	(0.016)	(0.022)	(0.016)	(0.022)	(0.016)
Observations	38,527	38,527	38,527	38,527	38,527	38,527	38,527	38,527
# BHCs	999	999	999	999	999	999	999	999
Adjusted R^2	0.303	0.349	0.303	0.348	0.302	0.348	0.303	0.349
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table provides the regression results of future BHC performance on aggregate institutional trading, its interaction with Sec20, its interaction with GLB, its interaction with Sec20, and FHC, and controls. Sec20 is a dummy variable that equals one for BHC-quarters when a BHC has established Section 20 subsidiary and zero otherwise. FHC is a dummy variable that equals one for non-Section 20 BHCs that are designated as Financial Holding Companies after the enactment of GLBA and zero otherwise. We use ROA to measure BHC profitability. LLP is loan loss provision over total assets. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different quarters. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

More importantly, the expansion of bank power definitely changes how different institutions view certain bank characteristics. Loosely speaking, institutions are willing to take on more risk when investing in BHCs with the expansion of bank power; again, the effect is most significant for early adopters of non-banking power. The trading predictability analysis of bank performance produce mixed results but, in general, suggests that the increase in bank opaqueness appears to enhance information advantages of grey and long-term institutional investors relative to those of independent and short-term institutional investors, especially when focusing on BHCs' operating performance. Hence, the expansion of bank power attracts more institutional investment to those with practice in non-traditional banking areas. But at the same time, the increased opacity makes it more challenging for institutional investors to make informed investment/trading decisions. The complicated patterns in institutional investing preferences and bank performance predictability suggest that the impact of GLB Act depends not only on bank type but also depends on institutional investor type as they are different along investment objectives and information advantages.

Chapter 2. Do Institutional Investors Know Banks Better? Evidence from Institutional Trading Surrounding the 2008 Financial Crisis

2.1 Introduction

Institutional investing in the stocks of banks has increased dramatically for the past decade in U.S.; the median institutional ownership in bank holding companies (BHCs) has increased from around 10% in 2001 to more than 40% in 2013. However, systematic evidence regarding their roles in the banking industry is scarce despite the fact that banks provide important services in the economy and the governance of banks is more important than ever since the 2008 financial crisis (Becht et al. (2011)). In U.S. alone, this crisis wiped out over 50% market capitalization, led to drastic deterioration in financial institutions' balance sheets and fire sales due to the run on the shadow banking system. The catastrophic collapse of subprime mortgage securitization market raises the important question on how securitization affects lenders' screening incentives. Keys, Mukherjee, Seru, and Vig (2010) empirically examine this question and conclude that the screening standard of subprime mortgages is adversely affected by securitization practices.

With hindsight, it is obvious that some banks had taken excessive risk prior to the crisis that led to their subsequent collapses and tremendous losses of equity value. It then raises the questions how much institutional investors have anticipated this event and what role they played in the banking industry prior to the 2008 financial crisis. In this paper, we investigate these questions to shed light on the potential for institutional investors to be bank monitors. Empirical literature has documented institutional investors' monitoring role in the manufacturing sectors. For example, Nelson, and Weisbach (1998) show that institutions with large ownership positions often have access to board members and senior managers. Using invested firms' decisions on mergers and acquisitions, Chen, Harford, and Li (2007) show that only concentrated holdings by independent long-term institutions are related to post-merger performance and make withdrawal

of bad bids more likely. They also find that these institutions make long-term portfolio adjustments rather than trading for short-term gain and only sell in advance of very bad outcomes.

We follow the spirit of Chen, Harford, and Li (2007) in this study, but with an important twist to fit our purpose. We postulate that grey institutions, i.e., banks and insurance companies, have more information on BHCs with high exposure to the risk associated with securitization activities than do independent institutions, i.e. pension funds, investment companies and advisers. Banks are in the same business with other banks, they should know other banks better. Insurance companies are active participants in the securitization business by being the investors of these products or the insurers of mortgage backed securities. Both roles played by insurance companies suggest that they have the incentives to monitor banks. However, the premium received from insuring these securitized products can also taint their incentives. The case of AIG is a gruesome example. Nonetheless, in any case, these grey institutions are likely to have more information than independent institutions through their own business lines.

On the other hand, given institutional investors' experience and expertise in investing, independent institutions also have incentives to produce information. Extant literature also documents evidence that institutional trading is motived by the skills and information they possess. For example, Yan and Zhang (2009) find that stocks experiencing the largest increase in short-term institutional holdings have significantly higher earnings surprises and earnings announcement abnormal returns over the subsequent four quarters than stocks experiencing the largest decrease in short-term institutional holdings. Given the complex incentives of grey institutions and the normal investment incentives of independent investors, it is indeed an empirical issue, how they have traded invested banks prior to the financial crisis.

The 2008 crisis is definitely qualified to be a very bad outcome. To protect their investments, better informed institutional investors regardless of their investment horizons should reduce their holdings of banks that have a high potential of collapsing. Using BHCs' reported securitization level in FR Y-9C, we find that grey institutions reduce aggregate holdings in BHCs at least 6 months before the crisis hit. More strikingly, they reduce holdings in high-exposure BHCs at least one year before the crisis hit. Independent institutions also reduce their holdings in high-exposure BHCs sometime before the crisis. The results are robust even after controlling for heterogeneity among BHCs and potential endogeneity issues.

The securitization information obtained in FR Y-9C only shows the quantity of involvement in securitization. But the volume of activities does not necessarily translate into worse quality of deals. In this paper, we utilize a unique dataset, *BBx data*^{TM}, provided by BlackBox Logic to formally examine deal quality. $BBx\ Data^{TM}$ covers over 90% of the U.S non-agency residential mortgage backed securities (RMBS) market. It contains more than 7,400 deals, 21 million loans, and over 740 million remittance records dating back to 1999. The coverage includes all the mortgage market sectors, i.e., Jumbo A, Prime, Subprime, and Alt A deals. To match BHCs with deals they issued, we use the deal identifications provided in BBx Data to look up each deal's prospectus (Form 424B5) in SEC EDGAR and find the issuer for the deal from the prospectus. We are able to identify 2,152 deals whose issuers are in our BHC sample over the period of 2001-2013.

When we add BBX deal quality measures and confine ourselves to only issuing BHCs, we find that grey institutions tilt their investment towards BHCs that issue safer securitization deals prior to the crisis. Specifically, we find that grey institutions prefer BHCs that issue deals with higher documentation level and higher proportion of owner-occupied properties over the four

quarters leading up to the crisis; they also tilt their portfolios away from BHCs that issue deals with missing FICO or combined CLTV information. In contrast, independent institutions appear to increase holdings in BHCs that issue riskier deals; for example, deals with lower documentation levels, lower proportion of prime mortgages, and smaller proportion of owner-occupied properties over the same pre-crisis period. The ownership of independent institutions also loads positively on deals with no FICO scores.

Finally, to further test whether the trading is information driven, we investigate whether the trading of institutions before crisis can predict BHCs' stock performance and operating performance during the crisis. We perform an event study on the Lehman Bankruptcy. We find that the trading of both grey institutions and independent institutions before the crisis can predict BHCs' event day returns, but grey institutions do a much better job in predicting event returns for high-exposure BHCs. Furthermore, we find no evidence of price reversal for high-exposure BHCs based on the trading of grey institutions. The evidence lends more support to the conjecture that the trading of grey institutions is driven by the better information they possess instead of negative fund flows they experience before the crisis. We also find some evidence that the pre-crisis trading of grey institutions can predict high-exposure BHCs' profitability during the crisis.

To the best of our knowledge, our study is the first paper systematically examining the role of institutional investors in the banking industry surrounding the 2008 crisis. The closest paper that we can find is by Cziraki (2013) who uses bank executives' trading in their own banks' stocks to infer their knowledge about the impendent crisis and finds that insiders of banks with a high exposure to the housing market sell 39% more equity than insiders of low-exposure banks. Unlike Cziraki (2013) who uses the correlation between the returns on the Barclays index of BBB-rated collateralized mortgage-backed securities (MBS) and the stock returns of the banks during July

2007 – December 2008 to proxy a bank's exposure to the housing market, we use a more direct measure—BHCs' reported securitization level in FR Y-9C. We also obtain specific securitization deal information in BBx dataset and formally examine the FICO score, combined loan-to-value ratio, documentation level, mortgage owner status, and proportion of prime mortgages in deals issued by BHCs.

In addition, this paper also contributes to literature in the role of institutional investors in the financial markets. As Becht et al. (2011) point out, the evidence of shareholder oversight in the banking industry is scarce despite its importance. We fill the gap by documenting the trading patterns of institutional investors prior to the 2008 Crisis. We show that institutional investors, particularly insurance companies and banks, are concerned about the subprime mortgage securitization practices in some BHCs prior to the 2008 crisis. Their votes with their feet suggest that these grey institutions oppose such risk-taking behaviors of some BHCs, which failed catastrophically during the crisis. However, the lack of evidence from independent investors and the magnitude of trading effects from grey institutions suggest that it is insufficient to entirely rely on institutional investors to monitor the banking industry. Our analysis, thus, also adds to the literature on governance through trading, (e.g., Edmans and Manso (2011) and Chang, Lin, Ma (2014)), that trading of institutional investors can serve as a commitment device that punish or reward firms making the decisions they make.

The remainder of the paper is organized as follows. We describe our date sources and definitions of key variables in Section 2.2, and provide descriptive statistics and univariate analysis in Section 2.3. Our main empirical results are provided in Section 2.4. Section 2.5 concludes the paper.

2.2 Data Sources and Variable Construction

2.2.1 Sample selection and BHC characteristics

To construct our sample, we start with the "Federal Reserve Bank of New York, 2013 CRSP-FRB link."[9] The linking table includes 1,289 PERMCO-RSSD links from January 1, 1990 to September 30, 2012. The table reports name, entity type, entity ID, PERMCO, as well as the starting and ending dates for the link. The entity ID (RSSD9001) is the primary identifier for reporting institutions. It never changes and is never reused. We only keep the entities listed as "Bank Holding Company", i.e., we exclude "Commercial Bank" and "Thrift Holding Company". Furthermore, we exclude from our sample the BHCs that were not held by any institutional investors over the sample period. We obtain the financial data for sample BHCs from FR Y-9C maintained by Federal Reserve Board of Chicago. Our sample starts from 2001 as it's the first year when the Y9-C began reporting securitization by asset type; and our sample ends in 2013. We get stock return information from CRSP daily stock file.

Following Peria and Schumkler (2001), and Hadad, Agusman, Monroe, Gasbarro and Zumwalt (2011), we construct several BHC characteristic measures. Appendix A describes the detail variable items used from Y-9C reports. Below we discuss the economic meaning of these variables:

(1) Liquidity risk. We measure a BHC's balance sheet liquidity by the ratio of liquid assets over total assets (LIQ).

(2) Credit risk or loan quality. We compute the sum of loans past due 90 days or more and loans not accruing for bad loans, scaled by total assets (LQLT).

[9] For more information, refer to http://www.newyorkfed.org/research/banking_research/datasets.html.

(3) Capital adequacy. We use total equity capital over total assets (EQT).

(4) Profitability. We use return on assets (PRF).

(5) Insolvency risk. We use Z-score to capture a BHC's insolvency risk; it equals the return on assets plus the capital asset ratio, $ROA + EQT/\sigma_{ROA}$. It measures the number of standard deviations that profits must fall to drive a BHC into insolvency. It's essentially a measure of the distance to default for a given BHC.

(6) Efficiency. We use the ratio of noninterest expenditures to total assets (EFF).

Following Ellul and Yerramilli (2013), we also collect the following measures for our sample BHCs:

(7) Reliance on off-balance-sheet activity. We use the ratio of noninterest income over total net income (NONINC).

(8) Time-varying risk preferences. We use BHC's derivative trading over assets (DT) and BHC's derivative hedging over assets (DH).

To measure securitization-related activities, we estimate the following measures:

(9) Private MBS (PMBS). It's calculated as the total value of private-label mortgage-backed securities held in both trading and investment portfolios.

(10) Mortgage securitization. We measure a BHC's mortgage securitization activities by the sum of mortgage and home equity lines securitized over total assets (SCT_MGG).

(11) Aggregate asset securitization. To measure a BHC's aggregate exposure to asset securitization, we use the sum of all securitized assets over total assets, included asset categories are securitized family residential loans, home equity lines, credit card receivables, and other consumer loans, and commercial & industrial loans (SCT_All).

We also include the logarithm of BHC assets (Size) as total assets have been shown to be a proxy for bank diversification potential (Brewer, 1989). Larger banks may also be redeemed safer by investors due to "too big to fail". Lastly, we add two BHC stock performance measure. QRET is for compounded stock return over the quarter using BHCs' daily return data; QVOL is quarterly return volatility, calculated as the variance of daily returns over the quarter. We winsorize variables at the one and 99 percentile to mitigate the impact of outliers.

2.2.2 Institutional ownership

We collect institutional holding data from Thomson-Reuters Institutional Holdings (13f) Database. Institutional investors that use United States mail in their business and exercise investment discretion over $100 million are required to file Form 13F with SEC pursuant to Section 13(f) of the Securities Exchange Act of 1934. Form 13F filings provide information regarding the securities holdings of institutional investors. Exceptions are small positions that include fewer than 10,000 shares of a given issuer and the aggregate fair market value of the same position is less than $200,000. The commonly used databases for institutional holdings are the Thomson Financial sets that are also known as CDA/Spectrum 13f database. The Thomson sets are available on WRDS as part of the Thomson Financial Network (TFN).

TFN classifies institutions into five types: 1) banks; 2) insurance companies; 3) investment companies and their managers; 4) independent investment advisers; and 5) others (pension funds, endowments, etc.). One issue with TFN 13f data is that there are serious classification errors in recent years. Many banks (TYPECODE=1) and Independent Investment Advisors (TYPECODE=4) are misclassified as others (TYPECODE=5) in 1998 and beyond. Previous studies usually correct this problem by replacing a manager's TYPECODE after 1998 with the TYPECODE reported before 1998. After further investigating the data, we find that

misclassification can happen to institutions whose post-1998 TYPECODE is not 5 as well. For example, Brown Brothers Harriman & CO had a TYPECODE of "5" up to September 30, 2008 after which its TYPECODE was recorded as "1"; or Epoch Investment Partners, Inc. whose TYPECODE changed from "5" before December 31, 2006 to "4" afterwards. To fully address this issue, we replace an institution's later date TYPECODE with its earliest date TYPECODE. Because the MGRNO identifiers are reused in TFN 13(f), we assign a new unique identifier to each included institution based on its MGRNAME, MGRNO, and RDATE in TFN. Whenever in doubt, we double check the institution's information on EDGAR and the institution's website (if a website is available). Then we further confine our sample to institutions that have ever invested in BHCs. We merge BHCs and their institutional investors using CUSIP.

Literature has shown that institutional investors differ significantly depending on the types of investment strategies, horizons, and information advantages. In the context of investing in BHCs, institutional investors may have different degrees of relationships with these BHCs. For example, insurance companies and banks might have stronger business ties with BHCs that they invest; while other institutions, such as independent advisers may be more independent from these BHCs. Following Chen, Harford, and Li (2007), we group institutions into two categories: we classify types 3 and 4 as well as public pension funds from type 5 as independent institutions; and types 1 and 2 as well as the remaining institutions from type 5 as grey institutions, we denote this as Definition 1; in alternative specification, we include only banks and insurance companies as grey institutions to better fit our research purpose, we denote this as Definition 2.

It is intuitive that bank-type institutional investors are better informed about BHCs' business and performance than do independent institutions due to their own operations in the same business and syndication relationships with invested BHCs. For insurance company-type

institutional investors, they also enjoy developed business relationship with BHCs and/or are active participants of securitization market and CDS market. For example, in an introductory statement about its mortgage insurance product, "United Guaranty", AIG states that "private mortgage insurance helps lenders by providing protection against the risk of a borrower defaulting on a mortgage loan…United Guaranty provides responsible risk management with its risk-based pricing model, which prices the mortgage insurance premium according to the unique risk of each loan."[10]

Similarly, Wells Fargo Mortgage Backed Securities 2004-D Trust states in its prospectus "WFHM supplements the mortgage loan underwriting process with either its own proprietary scoring system or scoring systems developed by third parties such as Freddie Mac's Loan Prospector, Fannie Mae's Desktop Underwriter or scoring systems developed by private mortgage insurance companies"

In addition, insurance companies are also involved in securitization deals directly. For example, J.P. Morgan Mortgage Acquisition Trust 2006-HE2 states in its prospectus "One or more insurance companies may issue a financial guaranty insurance policy covering certain payments to be made on net interest margin securities to be issued by a separate trust and secured by all or a portion of the Class C certificates and the Class P Certificates." For another example, Morgan Stanley ABS Capital I INC. Trust 2003-HE1 states in its prospectus "…deficiencies in amounts otherwise payable on the securities or on specified classes will be covered by insurance policies and/or surety bonds provided by one or more insurance companies or sureties." Thus, it's

[10] Ironically, AIG failed miserably during the crisis. It'll be interesting to see if other insurance companies also have the incentive problem.

reasonable to assume that insurance companies also have more information than independent institutions.

We, therefore, construct three different institutional ownership measures and three trading variables. Total institutional ownership (IO_Total) is calculated as the ratio of a BHC's total shares held by 13f investors over the BHC's total shares outstanding. Total institutional ownership from grey institutions (IO_Grey) is computed as the percentage of shares outstanding held by grey institutions; total institutional ownership from independent institutions (IO_Indp) is computed as the percentage of shares outstanding held by independent institutions. CHGIO_Total, CHGIO_Grey, and CHGIO_Indp are corresponding trading measures. They are defined as the change in institutional ownership from previous quarter for a BHC.

2.2.3 Deal quality measures

We obtain the deal quality measures of securitized mortgages from $BBx\ Data^{TM}$ provided by BlackBox Logic. $BBx\ Data^{TM}$ covers over 90% of the U.S non-agency residential mortgage backed securities (RMBS) market. It contains more than 7,400 deals, 21 million loans, and over 740 million remittance records dating back to 1999. The coverage includes all the mortgage market sectors, i.e., Jumbo A, Prime, Subprime, and Alt A deals. To match BHCs with deals they issued, we use the deal identifiers provided in BBx Data to look up each deal's prospectus (Form 424B5) in SEC EDGAR and find the issuer for the deal from the prospectus. We are able to identify 2,152 deals whose issuers are in our BHC sample over the period of 2001-2013.

We collect average issue balance and deal issue year as control variables, and the following five different deal quality measures from BBx Data:

(1) Average FICO score for all loans in the deal (FICO);

(2) Average documentation level for all loans in the deal (DOC). For each mortgage, BBx reports one of the documentation status, “Full Documentation (FD)”, “Low Documentation (LD)”, “No Documentation (ND)”, “Reduced Documentation (RD)” and “Unknown (UN)”. We assign a value of 1 to mortgages with ND or UN, a value of 2 to mortgages with RD or LD, and a value of 3 to mortgages with FD. We then compute the average documentation level of all mortgages included in one deal as the deal’s average documentation level.

(3) Combined loan-to-value (CLTV). BBx reports the ratio of all loan amounts on the property at the time of origination to the property value at loan origination for each mortgage. We compute the mean value of all mortgages included in one deal as deal’s average CLTV.

(4) Proportion of prime mortgages in the deal (LSEC). BBx reports the credit sector each mortgage belongs, including “Alt-A (AA)”, “Prime (PR)”, “Subprime (SP)”, and “Unknown (UN)”. We assign a value of 1 to mortgages with UN or SP, a value of 2 to mortgages with AA, and a value of 3 to mortgages with PR. Then we compute the average value of all mortgages in one deal as the deal’s average loan sector, the higher the value the higher portion of prime mortgages in the deal.

(5) Property occupancy status. BBx provides occupancy types: “Non Owner Occupied”, “Other”, “Owner Occupied”, “Second Home”, “Unknown” and “Vacant”. We assign a value of 1 to mortgages recorded as “Owner Occupied” and a value of 0 to the rest mortgages. We then compute the average value of all mortgages in one deal as the deal’s average owner-occupancy. The higher the value, the more properties are owner-occupied in the deal.

2.3 Descriptive Statistics

2.3.1 Descriptive statistics for BHC characteristics

Table 2.1 reports summary statistics for BHC characteristics. Panel A presents the descriptive statistics of churn rate and the proportion of blockholders for each type of institutions. We provide mean, median, standard deviation, 25^{th} percentile, and 75^{th} percentile for each variable. Independent investment advisers and "Others" seem to turn over their portfolio faster than banks and insurance companies. And investment companies have higher percentage of blockholders than other groups. When we group institutions together based on their potential business ties with the BHCs they invest, we find that independent institutions appear to have higher portfolio turnover rate and are more likely to be blockholders than grey institutions (it applies to both definitions of grey institutions).

In Panel B we provide the summary statistics of BHC characteristics and institutional ownership. The mean and median for BHC size are fairly close, indicating that our size measure is fairly symmetrical after taking logarithm of the book value of asset. An average BHC holds around 22% liquid assets, has 0.44% return on assets, and keeps around 9.37% of asset value in equity capital.

On average, BHCs spend 2% of assets in noninterest expense. Nonperforming loans, estimated by the sum of loans over 90 days late and loans not accruing, take up around 1.2% for an average BHC. Z-score has a mean 41, suggesting that the profit must fall at least 41 standard deviations to drive an average BHC into insolvency. The distribution of derivatives used for trading and hedging are highly skewed, and indicates that not every BHC is equally active in using derivatives. For an average BHC, the noninterest income accounts for around 19% of its total net income. The securitization-related measures are also skewed, indicating not every BHC is equallty

Table 2.1 Summary statistics

Panel A. Sample institution characteristics						
Institution type	Variable	Mean	Median	Std Dev	P25	P75
Banks	Churn rate	0.17	0.13	0.17	0.08	0.21
	%BLK5	1.04	0.00	10.13	0.00	0.00
Insurance companies	Churn rate	0.20	0.17	0.17	0.11	0.24
	%BLK5	0.20	0.00	4.47	0.00	0.00
Investment companies	Churn rate	0.21	0.18	0.17	0.11	0.26
	%BLK5	4.54	0.00	20.81	0.00	0.00
Independent investment advisers	Churn rate	0.29	0.23	0.25	0.13	0.37
	%BLK5	0.88	0.00	9.33	0.00	0.00
Public pension funds	Churn rate	0.11	0.10	0.08	0.06	0.14
	%BLK5	0.02	0.00	1.28	0.00	0.00
Others	Churn rate	0.68	0.29	0.74	0.14	1.12
	%BLK5	0.91	0.00	9.49	0.00	0.00
Independent institutions	Churn rate	0.27	0.20	0.23	0.11	0.34
	%BLK5	1.29	0.00	11.27	0.00	0.00
Grey institutions (Def. 1)	Churn rate	0.18	0.14	0.17	0.09	0.22
	%BLK5	0.82	0.00	9.01	0.00	0.00
Grey institutions (Def. 2)	Churn rate	0.18	0.14	0.19	0.09	0.22
	%BLK5	0.87	0.00	9.26	0.00	0.00
All institutions	Churn rate	0.24	0.18	0.23	0.10	0.29
	%BLK5	1.09	0.00	10.38	0.00	0.00

Panel B. BHC characteristics						
Variable	Mean	Median	Std Dev	25th Pctl	75th Pctl	% Securitizing BHCs
Size	14.63	14.22	1.63	13.49	15.35	23.15%
LIQ %	22.17	20.49	11.30	14.02	28.66	23.15%

(Table 2.1 continued)

Variable	Mean	Median	Std Dev	25th Pctl	75th Pctl	% Securitizing BHCs
PRF %	0.44	0.48	0.83	0.23	0.81	23.15%
EQT %	9.37	9.06	2.74	7.70	10.64	23.15%
EFF %	2.00	1.81	1.29	1.08	2.61	23.15%
LQLT %	1.18	0.62	1.57	0.28	1.42	23.15%
Z-score	41.05	31.41	36.81	23.71	45.67	23.15%
DT %	28.15	0.00	232.44	0.00	0.00	23.15%
DH %	3.95	0.04	9.96	0.00	3.05	23.15%
NONINC %	0.19	0.16	0.13	0.11	0.23	23.15%
SCT_MGG %	1.00	0.00	5.79	0.00	0.00	23.15%
SCT_ALL %	1.30	0.00	7.05	0.00	0.00	23.15%
PMBS %	0.58	0.00	1.77	0.00	0.13	23.15%
QRET %	2.39	1.99	17.81	-5.66	10.50	23.15%
QVOL (*10,000)	9.64	3.61	21.35	1.95	7.87	23.15%
IO_Total	29.15	23.14	23.22	9.90	45.43	23.15%
IO_Grey (Def. 2)	12.60	9.76	10.90	3.48	19.93	23.15%
IO_Grey (Def. 1)	7.57	5.18	7.59	1.19	12.31	23.15%
IO_Indp	17.18	13.29	15.00	4.92	26.27	23.15%

Panel C. Univariate comparison between securitizing and non-securitizing BHCs

	Non-securitizing		Securitizing		T-test		Wilcoxon test	
Variable	Mean	Median	Mean	Median				
Size	14.23	14.00	15.95	15.72	52.18	***	51.57	***
LIQ %	22.04	20.38	22.61	20.84	3.01	***	3.57	***
PRF %	0.42	0.46	0.52	0.54	7.58	***	10.44	***
EQT %	9.35	9.07	9.43	9.02	1.64		1.39	
EFF %	1.99	1.81	2.07	1.82	3.33	***	1.37	
LQLT %	1.14	0.58	1.28	0.73	4.99	***	10.55	***

(Table 2.1 continued)

Variable	Non-securitizing		Securitizing		T-test		Wilcoxon test	
	Mean	Median	Mean	Median				
Z-score	42.16	32.04	37.35	29.45	-8.65	***	-9.75	***
DT %	3.73	0.00	109.24	0.00	15.06	***	41.98	***
DH %	2.20	0.00	9.75	2.57	29.92	***	44.46	***
NONINC %	0.17	0.15	0.24	0.21	29.36	***	33.76	***
SCT_MGG %	0.00	0.00	4.31	0.00	25.29	***	84.90	***
SCT_ALL %	0.00	0.00	5.61	0.00	27.22	***	93.24	***
PMBS %	0.47	0.00	0.97	0.00	13.76	***	21.50	***
QRET %	2.44	1.99	2.20	1.99	-0.80		-0.26	
QVOL (*10,000)	9.83	3.79	9.00	3.10	-2.37	**	-10.58	***
IO_Total	26.07	19.60	39.37	39.29	32.75	***	32.68	***
IO_Grey (Def. 2)	10.95	8.33	18.09	18.42	35.86	***	35.74	***
IO_Grey (Def. 1)	6.22	4.14	12.03	12.09	39.65	***	40.34	***
IO_Indp	15.74	11.42	21.98	20.43	24.26	***	26.51	***

Notes: Panel A presents descriptive statistics of churn rate and percentage of blockholders for different types of institutions as well as the institutions as a whole along with the number of institution-BHC-quarters. Churn rate is calculated for each institution following Gaspar, Massa, and Matos (2005) and Cella, Ellul and Mariassunta (2013). Blockholders are defined as institutions who hold more than 5% shares of the BHC it invests. The definition one (Def.1) of grey institutions include banks, insurance companies and all institutions with typecode 5 in 13f that are not public pension funds. The definition two (Def.2) of grey institutions include only banks and insurance companies. Panel B reports the summary statistics of BHC characteristics as well as their institutional ownership. All variables are as defined in Appendix A. Panel C presents a univariate comparison of BHC characteristics between BHCs that report non-zero asset securitization over the sample period (Securitizing BHCs) and those for BHCs that report zero asset securitization over the sample period (Non-securitizing BHCs) over the sample period that starts from the beginning of 2001 to the end of 2013. There are 19,388 BHC-quarters in total in the whole sample, among which 14,900 are non-securitizing BHC-quarters and 4,488 are securitizing BHC-quarters for this period. The observations are at the bank-quarter level. There are 674 unique banks over the whole sample. See Appendix A for variable definitions. Tests of difference in mean (median) are t-tests (Wilcoxon signed-rank tests). *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

involved in securitization. The value of private-label mortgage-backed securities accounts for around 0.6% of its total assets. Average quarterly return for sample BHCs is 2.39% with a variance of 0.001.

On average, institutional investors hold 29.15% of sample BHCs' shares. Independent institutions seem to have a greater ownership in BHCs than grey institutions; but both have meaningful existence in BHCs.

In Panel C, we seek to understand the differences in characteristics between BHCs with high exposure to asset securitization and BHCs with low exposure to asset securitization. To do so, we aggregate sample BHCs' reported asset securitization (SCT_ALL) over the whole sample period, and then we treat BHCs with non-zero aggregated asset securitization as Securitizing BHCs and those with zero aggregated asset securitization as Non-securitizing BHCs. We then perform a T-test and Wilcoxon rank test of the values of various BHC characteristics.

As we can see, Securitizing BHCs are larger in size, hold a slightly bigger percentage of liquid assets, are more profitable, spend more on noninterest expense, and hold more bad loans, and have smaller distance to insolvency, are much more active in using derivatives for trading and hedging purposes than Non-securitizing BHCs. Securitizing BHCs attribute a greater percentage of their net income to non-interest-generating activities and hold a greater private-label MBS in their portfolios than do Non-securitizing BHCs. Over our sample period, Securitizing BHCs also have lower return volatility than Non-securitizing BHCs but the two groups do not seem to have different stock returns over the sample period. In terms of institutional investment, Securitizing BHCs have significantly higher institutional ownership than Non-Securitizing BHCs; the same holds for both grey institutions and independent institutions.

2.3.2 Descriptive statistics for deal characteristics

We present summary statistics for securitization deal related measures in Table 2.2 Panel A. We provide mean, median, standard deviation, 25th percentile and 75th percentile for each variable. Along with each variable, we also provide the number of deals that has available information to compute the statistic. Even though we are able to match 2,152 deals in total, some deals are missing one or more quality measures we use here. Grand mean of FICO scores is 700 with a median of 719. Combined loan-to-value has a mean of 79.46%, which tells us the average loan amounts on the deal property is about 80% of the property value at the time of loan origination. Average documentation level is 1.8, indicating that an average borrower in these deals provide some kind of income documentation but not full documentation. Loan sector indicator has a mean of 2.4, indicating the average loan lies between Alt-A and prime mortgages. Owner status indicator has a mean value of 0.79, suggesting that around 79% properties in the deal are the borrowers' primary residence. In addition, the average amount of loan principal outstanding at the time of deal issuance is around 360 thousands.

In Panel B of Table 2.2, we provide the number of deals issued each year. We can see active mortgage securitization activities by the BHCs from year 2002 through 2007. The securitization activities slow down after 2008 and we didn't find any BHC-issuing securitization deals after 2009 in our sample.

Table 2.2 Summary statistics for deal characteristics

Panel A. Deal characteristics						
Variable	Mean	Median	Std Dev	P25	P75	N
FICO	700.47	719.10	49.59	689.57	737.17	1,456
CLTV	79.46	79.30	7.65	75.44	83.94	1,665

(Table 2.2 continued)

Variable	Mean	Median	Std Dev	P25	P75	N
DOC	1.80	1.92	0.63	1.00	2.29	2,152
LSEC	2.40	2.85	0.73	1.97	2.97	2,152
OWNER	0.79	0.91	0.27	0.77	0.95	2,152
Issue Balance($1,000)	360.93	372.59	239.11	191.59	500.19	2,072

Panel B. Distribution of securitization deals

Year	# deals issued by BHCs	% of all BHC deals
2001	87	4.04%
2002	179	8.32%
2003	270	12.55%
2004	367	17.05%
2005	462	21.47%
2006	449	20.86%
2007	328	15.24%
2008	8	0.37%
2009	2	0.09%
Total	2,152	100.00%

Notes: In this table, we report summary statistics for deal characteristics. Deal quality measures are from BBx Data. FICO, is the average FICO score for all the mortgages in the deal. DOC is the average documentation level for all the mortgages in the deal. BBx reports documentation level for each mortgage: "Full Documentation (FD)", "Low Documentation (LD)", "No Documentation (ND)", "Reduced Documentation (RD)" and "Unknown (UN)". We assign a value of 1 to mortgages with ND or UN, a value of 2 to mortgages with RD or LD, and a value of 3 to mortgages with FD. DOC is the mean value of all mortgage documentation indicators in a deal. CLTV, is the average combined loan-to-value for all mortgages in a deal. LSEC is the indicator of proportion of prime mortgages in the deal.). BBx reports the credit sector each mortgage belongs, including "Alt-A (AA)", "Prime (PR)", "Subprime (SP)", and "Unknown (UN)". We assign a value of 1 to mortgages with UN or SP, a value of 2 to mortgages with AA, and a value of 3 to mortgages with PR. CLTV is then computed as the average of these numbers for all the mortgages in a deal. Owner is an indicator of occupancy status of the mortgages in a deal. BBx provides occupancy types: "Non Owner Occupied", "Other", "Owner Occupied", "Second Home", "Unknown" and "Vacant". We assign a value of 1 to mortgages recorded as "Owner Occupied" and a value of 0 to the rest mortgages. Owner is then computed as the average for all mortgages in one deal. Issue balance, the average amount of loan principal outstanding at the time of deal issuance (in $1,000). In Panel A, we report statistics for deal quality measures; and in Panel B, we provide the distribution of number of deals issued by BHCs through time.

2.4 Empirical Results

2.4.1 Institutional trading in BHCs prior to the 2008 Financial Crisis

We postulate that institutional investors, particularly grey institutions, with their expertise in investment and experience in the securitization markets may have some knowledge about the impending crisis and revise their assessment of investment prospect in BHCs. Following Ivashina and Scharfstein (2010), we define August 2006 to July 2007 as pre-crisis period and create four dummies for each of the four quarters leading up to the crisis. We analyze trading of institutional investors during these quarters.

Because the 2008 financial crisis is closely related to the excessive risk taking in securitization market, one natural question to ask is whether institutional investors discriminate between high securitization exposure BHCs and no (or low) exposure BHCs in their investment. We use three different proxies to classify BHCs. We first separate BHCs into securitizers and non-securitizers based on whether they report a non-zero balance of asset securitization on their balance sheet. Starting from the third quarter of 2001, securitization by asset type became available in FR Y9-C. The reported asset categories are 1-4 Family Residential Mortgage Loans, Home Equity Lines, Commercial and Industrial Loans, Credit Card, Auto, and Other Consumer Loans. We first construct two continuous variables to proxy for a BHC's exposure to securitization: SCT_MGG is the sum of mortgage and home equity lines securitized over total assets; SCT_ALL is the sum of all securitized assets over total assets. The third proxy captures BHCs' involvement in private-label mortgage-backed securities (PMBS). PMBS denotes the total value of private-label mortgage-backed securities held in both trading and investment portfolios over total assets. Following Ellul and Yerramilli (2013), we exclude mortgage-backed securities that are either issued or guaranteed by government-sponsored enterprises (GSEs) as they are less risky. We also

create three dummy variables: MGGD takes value of 1 if SCT_MGG is greater than 0 for a BHC and 0 otherwise over the quarter; ALLD takes value of 1 if SCT_ALL is greater than 0 for a BHC and 0 otherwise over the quarter; and PMBSD takes value of 1 if PMBS is greater than 0 for a BHC and 0 otherwise over the quarter.

We then employ a difference-in-difference type of analysis by estimating the following model for each type of institutional investors,

$$IO_{Type_{i,t}} = \alpha + \beta_0 * SCT_{i,t} + \sum_{k=1}^{4} \beta_{1,k} * Dummy_k + \sum_{k=1}^{4} \beta_{2,k} * Dummy_k * SCT_{i,t}$$
$$+\gamma * X_{i,t-1} + u_i + v_t + \varepsilon_{i,t} \quad (2.1)$$

In the above equation, $IO_{Type_{i,t}}$ denotes either grey or independent institutional ownership for BHC i in quarter t; $SCT_{i,t}$ is one of the above three securitization measures; Dummy 1 – 4 represent the third quarter of 2006, the fourth quarter of 2006, the first quarter of 2007, and the second quarter of 2007 respectively; $X_{i,t-1}$ is a vector of BHC characteristics that may affect institutional ownership. We also include BHC fixed effect and year fixed effect to control for unobservable heterogeneity. We are interested in the coefficients of pre-crisis dummies as well as the coefficients of interaction terms between securitization measures and pre-crisis dummies. The results are reported in Table 2.3.[11]

In Panel A, we report the results using continuous securitization measures. From the coefficients on the dummy variables, we see that grey institutions start to sell BHCs two quarters before the crisis hit. In addition, when moving on to the interaction terms, we find that grey institutions sell BHCs with high-exposure to mortgage securitization in 2006Q3 and they sell BHCs with high-exposure to PMBS in each of the four quarters before the crisis. In contrast,

[11] All regression analysis is implemented in STATA 12.

Table 2.3 Institutional ownership and BHC exposure to securitization

Panel A. Use continuous securitization measures						
	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGG	SCG_ALL	PMBS	SCT_MGG	SCG_ALL	PMBS
Dependent Var:	IO_Grey	IO_Grey	IO_Grey	IO_Indp	IO_Indp	IO_Indp
SCT_t	0.059***	0.069***	0.094	0.050	0.062	0.334***
	(0.021)	(0.019)	(0.069)	(0.047)	(0.044)	(0.129)
Dummy [1 for 2006Q3]	0.232***	0.217**	0.396***	0.299**	0.289**	0.281
	(0.084)	(0.085)	(0.106)	(0.144)	(0.146)	(0.193)
Dummy [1 for 2006Q4]	0.842***	0.830***	0.995***	0.499**	0.511**	0.500**
	(0.124)	(0.125)	(0.140)	(0.203)	(0.204)	(0.245)
Dummy [1 for 2007Q1]	-0.463***	-0.467***	-0.286*	-0.173	-0.152	-0.072
	(0.145)	(0.145)	(0.152)	(0.225)	(0.226)	(0.254)
Dummy [1 for 2007Q2]	-0.527***	-0.538***	-0.340***	-0.259	-0.245	-0.124
	(0.108)	(0.108)	(0.118)	(0.234)	(0.236)	(0.290)
SCT_t *	-0.041*	-0.022	-0.200***	-0.074*	-0.051	-0.061
Dummy [1 for 2006Q3]	(0.022)	(0.020)	(0.057)	(0.041)	(0.038)	(0.160)
SCT_t *	-0.012	0.005	-0.169**	-0.074**	-0.067**	-0.088
Dummy [1 for 2006Q4]	(0.025)	(0.024)	(0.066)	(0.035)	(0.030)	(0.156)
SCT_t *	-0.017	-0.003	-0.192***	-0.046	-0.053	-0.149
Dummy [1 for 2007Q1]	(0.024)	(0.022)	(0.064)	(0.073)	(0.061)	(0.193)
SCT_t *	-0.003	0.011	-0.187***	-0.027	-0.034	-0.166
Dummy [1 for 2007Q2]	(0.033)	(0.027)	(0.056)	(0.106)	(0.086)	(0.225)
Z_SCORE_{t-1}	-0.096	-0.098	-0.105	0.289	0.288	0.273
	(0.151)	(0.150)	(0.150)	(0.293)	(0.294)	(0.294)
LIQ_{t-1}	-0.013	-0.013	-0.017	0.012	0.012	0.001
	(0.015)	(0.015)	(0.015)	(0.031)	(0.031)	(0.031)
PRF_{t-1}	0.239***	0.241***	0.237***	-0.126	-0.125	-0.133
	(0.078)	(0.078)	(0.078)	(0.138)	(0.138)	(0.138)
$LQLT_{t-1}$	-0.286***	-0.287***	-0.284***	-0.157	-0.158	-0.166

(Table 2.3 continued)

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGG	SCG_ALL	PMBS	SCT_MGG	SCG_ALL	PMBS
Dependent Var:	IO_Grey	IO_Grey	IO_Grey	IO_Indp	IO_Indp	IO_Indp
	(0.073)	(0.073)	(0.074)	(0.153)	(0.152)	(0.152)
EQT_{t-1}	0.163***	0.161***	0.168***	1.052***	1.050***	1.057***
	(0.046)	(0.046)	(0.046)	(0.100)	(0.100)	(0.100)
$SIZE_{t-1}$	2.243***	2.250***	2.249***	5.201***	5.205***	5.255***
	(0.402)	(0.397)	(0.403)	(0.879)	(0.877)	(0.870)
$QRET_{t-1}$	-0.000	-0.000	-0.000	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
$QVOL_{t-1}$	0.001	0.001	0.001	-0.019***	-0.019***	-0.019***
	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)
EFF_{t-1}	-1.891	-2.184	-1.568	-3.008	-3.279	-2.678
	(3.047)	(3.028)	(3.064)	(4.510)	(4.527)	(4.507)
DT_{t-1}	-0.500***	-0.492***	-0.485***	-0.737***	-0.732***	-0.725***
	(0.069)	(0.066)	(0.076)	(0.194)	(0.194)	(0.200)
DH_{t-1}	0.887	0.669	1.086	0.111	-0.041	0.208
	(1.365)	(1.354)	(1.359)	(2.713)	(2.682)	(2.707)
$NONINC_{t-1}$	1.343	1.194	1.551	0.612	0.467	0.819
	(1.341)	(1.336)	(1.320)	(2.845)	(2.798)	(2.903)
Constant	-27.249***	-27.349***	-27.294***	-73.261***	-73.334***	-73.975***
	(5.641)	(5.584)	(5.666)	(12.523)	(12.496)	(12.383)
Observations	19,388	19,388	19,388	19,388	19,388	19,388
Number of BHCs	674	674	674	674	674	674
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.633	0.631	0.636	0.458	0.458	0.467
Panel B. Use securitization dummies						
	(1)	(2)	(3)	(4)	(5)	(6)

(Table 2.3 continued)

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGGD	SCG_ALLD	PMBSD	SCT_MGGD	SCG_ALLD	PMBSD
Dependent Var:	IO_Grey	IO_Grey	IO_Grey	IO_Indp	IO_Indp	IO_Indp
$SCTD_t$	0.514	0.588	0.482**	-0.304	0.192	0.551
	(0.537)	(0.461)	(0.228)	(1.240)	(0.988)	(0.466)
Dummy [1 for 2006Q3]	0.281***	0.279***	0.516***	0.360**	0.409**	0.683**
	(0.096)	(0.099)	(0.149)	(0.166)	(0.170)	(0.279)
Dummy [1 for 2006Q4]	0.835***	0.823***	0.904***	0.495**	0.547**	0.790**
	(0.132)	(0.134)	(0.184)	(0.217)	(0.222)	(0.337)
Dummy [1 for 2007Q1]	-0.431***	-0.442***	-0.161	-0.245	-0.181	0.146
	(0.147)	(0.151)	(0.200)	(0.240)	(0.246)	(0.310)
Dummy [1 for 2007Q2]	-0.509***	-0.541***	-0.520***	-0.371	-0.300	-0.021
	(0.113)	(0.121)	(0.181)	(0.255)	(0.262)	(0.378)
$SCTD_t *$	-0.862*	-0.717	-0.673**	-1.324	-1.558*	-0.942*
Dummy [1 for 2006Q3]	(0.466)	(0.446)	(0.261)	(0.953)	(0.873)	(0.511)
$SCTD_t *$	0.002	0.124	-0.155	-0.784	-1.091	-0.756
Dummy [1 for 2006Q4]	(0.623)	(0.581)	(0.302)	(0.815)	(0.757)	(0.526)
$SCTD_t *$	-0.483	-0.298	-0.633**	0.451	-0.245	-0.718
Dummy [1 for 2007Q1]	(0.583)	(0.542)	(0.290)	(1.174)	(1.060)	(0.517)
$SCTD_t *$	-0.171	0.153	0.004	1.148	0.241	-0.522
Dummy [1 for 2007Q2]	(0.543)	(0.549)	(0.292)	(1.325)	(1.150)	(0.618)
Z_SCORE_{t-1}	-0.107	-0.109	-0.115	0.283	0.281	0.274
	(0.151)	(0.150)	(0.149)	(0.294)	(0.295)	(0.295)
LIQ_{t-1}	-0.014	-0.014	-0.016	0.011	0.011	0.009
	(0.015)	(0.015)	(0.015)	(0.031)	(0.031)	(0.031)
PRF_{t-1}	0.239***	0.241***	0.238***	-0.122	-0.124	-0.128
	(0.078)	(0.078)	(0.078)	(0.138)	(0.138)	(0.138)
$LQLT_{t-1}$	-0.287***	-0.286***	-0.284***	-0.151	-0.155	-0.154
	(0.074)	(0.074)	(0.074)	(0.153)	(0.153)	(0.152)
EQT_{t-1}	0.166***	0.166***	0.168***	1.055***	1.055***	1.059***

(Table 2.3 continued)

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGGD	SCG_ALLD	PMBSD	SCT_MGGD	SCG_ALLD	PMBSD
Dependent Var:	IO_Grey	IO_Grey	IO_Grey	IO_Indp	IO_Indp	IO_Indp
	(0.046)	(0.046)	(0.046)	(0.100)	(0.100)	(0.099)
$SIZE_{t-1}$	2.215***	2.203***	2.201***	5.211***	5.185***	5.148***
	(0.407)	(0.407)	(0.402)	(0.896)	(0.897)	(0.879)
$QRET_{t-1}$	-0.000	-0.000	-0.000	0.002	0.002	0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
$QVOL_{t-1}$	0.002	0.002	0.001	-0.019***	-0.018***	-0.019***
	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)
EFF_{t-1}	-1.667	-1.667	-2.198	-2.755	-2.808	-3.450
	(3.057)	(3.050)	(3.115)	(4.505)	(4.500)	(4.606)
DT_{t-1}	-0.489***	-0.489***	-0.474***	-0.725***	-0.727***	-0.709***
	(0.077)	(0.077)	(0.076)	(0.202)	(0.202)	(0.204)
DH_{t-1}	0.971	0.996	0.941	0.212	0.181	0.120
	(1.401)	(1.394)	(1.369)	(2.733)	(2.732)	(2.724)
$NONINC_{t-1}$	1.495	1.461	1.632	0.851	0.786	0.941
	(1.345)	(1.331)	(1.325)	(2.914)	(2.911)	(2.918)
Constant	-26.824***	-26.680***	-26.779***	-73.302***	-72.999***	-72.700***
	(5.724)	(5.724)	(5.643)	(12.714)	(12.717)	(12.490)
Observations	19,388	19,388	19,388	19,388	19,388	19,388
Number of BHCs	674	674	674	674	674	674

(Table 2.3 continued)

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGGD	SCG_ALLD	PMBSD	SCT_MGGD	SCG_ALLD	PMBSD
Dependent Var:	IO_Grey	IO_Grey	IO_Grey	IO_Indp	IO_Indp	IO_Indp
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.636	0.636	0.636	0.457	0.457	0.458

Notes: We presents the results from regressions of different institutional holdings on BHC risk measures, dummy variables for the 4 quarters leading up to the crisis, one of our securitization level measures, as well as the interactions of securitization measure and dummy variables. See Appendix A for variable definitions. We obtain BHC securitization information from Y-9C. SCT_MGG, the amount of mortgage securitized over total assets. The amount of mortgage securitized is obtained by adding outstanding principal balance of assets sold and securitized with recourse or other seller-provided credit enhancements – home equity lines (BHCKB706) and 1-4 family residential loans (BHCKB705). SCT_ALL, the sum of all securitized assets over total assets. All securitized assets value is obtained by adding the values of outstanding principal balance of assets sold and securitized with recourse or other seller-provided credit enhancements from the following six categories: 1-4 family residential loans (BHCKB705), home equity lines (BHCKB706), credit card receivables (BHCKB707), auto loans (BHCKB708), other consumer loans (BHCKB709), and commercial and industrial loans (BHCKB710). Private-label MBS (PMBS) is the total value of private-label mortgage-backed securities held in both trading and investment portfolios (scaled by total assets); this excludes mortgage backed securities that are either issued or guaranteed by government sponsored enterprises. The reported asset categories are 1-4 Family Residential Mortgage Loans, Home Equity Lines, Commercial and Industrial Loans, Credit Card, Auto, and Other Consumer Loans. We create two dummy variables to identify BHCs that are active securitizers: SCT_MGGD takes value of 1 if a BHC's sum of mortgage and home equity lines securitized over total assets is greater than 0 and 0 otherwise; SCT_ALLD takes value of 1 if a BHC's the sum of all securitized assets over total assets is greater than 0, and 0 otherwise. PMBSD takes value of 1 if a BHC's holding of private-label MBS is not zero and 0 otherwise. In Panel A, we present the results using continuous securitization measures: SCT_MGG, SCT_ALL, and PMBS; in Panel B, we present the results using securitization dummies: SCT_MGGD, SCT_ALLD, PMBSD. The results using definition one of grey institutions are provided in Appendix E. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different years. We cluster standard error at BHC level to allow for intragroup correlation. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

independent institutions only sell BHCs with high-exposure to mortgage securitization in 2006Q3 and 2006Q4 as well as BHCs with high-exposure to asset securitization in 2006Q4. But they do not sell BHCs in general or BHCs with high-exposure to PMBS. The results suggest that both types of institutions sell BHCs with high-exposure to securitization before the crisis to some extent, but grey institutions sell more BHCs in general before the crisis and their selling is more pronounced in BHCs holding more private-label MBS.

Most control variables have their expected signs: both grey and independent institutors prefer to hold better capitalized BHCs and larger BHCs but avoid BHCs with excessive derivative tradings. In addition, grey institutions prefer BHCs that are more profitable and have better loan quality. By contrast, independent institutions prefer BHCs with lower stock-return volatility.

We repeat the tests using securitization dummies in Panel B. The results are similar to those using continuous variables, though the selling of non-zero PMBS BHCs is somewhat weaker than the selling of high-exposure PMBS BHCs by grey institutions. Furthermore, the selling of non-zero mortgage BHCs by independent institutions is now insignificant and independent institutions also sell some non-zero PMBS BHCs in 2006Q3.

2.4.2 Addressing endogeneity and reverse causality concerns

In last section, we find evidence that institutions reduce their holdings in high-exposure BHCs before the crisis and grey institutions seem to sell more in BHCs that hold riskier PMBS. A few concerns may arise in that a BHC's decision to securitize could be determined endogenously. For example, the institution–BHC matching might be nonrandom; some BHCs' decision to securitize may be affected by the percentage of their shares held by institutional investors; or the difference in institutional ownership between securitizing and non-securitizing BHCs may reflect other BHC characteristics rather than securitization. In this subsection, we provide a series of robustness

checks to address this concern. For this subsection, we confine our sample to the four quarters immediately before the crisis, i.e., 2006Q3 to 2007Q2.

Our first robustness test addresses the concern that BHCs are heterogeneous. As Table 2.1 shows, BHCs that choose to involve in securitization are very different from those that do not. These different characteristics could be the main drivers that affect institutional ownership. To control for this possibility, we use propensity score matching (PSM). PSM allows us to examine institutional ownership of the securitizing BHCs in comparison with a matched control sample of non-securitizing BHCs.

To implement PSM, we first utilize probit regressions with one of our securitization dummies (PMBSD, SCT_MGGD and SCT_ALLD) being the dependent variable. The regressions can help us to identify BHC characteristics that contribute to a BHC's probability of being involved in the securitization activities. We run the probit regressions with all of our BHC risk measures with year fixed effect. We then calculate each BHC's propensity score based on the probability that a BHC with given characteristics actively involved in securitization. With the computed propensity score, we match securitizing BHCs with non- securitizing BHCs (using the nearest neighbors and matching within a 0.01 caliper). Lastly, we implement univariate tests to compare the difference in mean institutional ownership between the treated and the matched sample for each of the 4 quarters leading up to the crisis as well as the whole pre-crisis period. We report the univariate test results in Table 2.4.[12] The results show that independent institutions sell more BHCs reporting non-zero mortgage or asset securitization than they sell control group BHCs before the crisis, with a difference in mean institutional ownership of 4.77% and 5% respectively. In contrast,

[12] For brevity, we only report second stage results for PSM and IV regressions here, first stage results are available upon request.

Table 2.4 Institutional ownership and bank securitization: propensity score matching

Panel A. Mean difference in institutional ownership using mortgage securitization dummy										
	IO_Grey					IO_Indp				
	2006Q3	2006Q4	2007Q1	2007Q2	Pre-Crisis	2006Q3	2006Q4	2007Q1	2007Q2	Pre-Crisis
Observations	387	380	374	372	1,513	387	380	374	372	1,513
ATT	-2.214	-2.381	1.107	-0.809	-0.409	-4.618	-6.194	-1.559	-0.532	-4.774
T-value	-1.009	-1.101	0.509	-0.366	-0.349	-0.898	-1.348	-0.299	-0.0963	-1.706*
Panel B. Mean difference in institutional ownership using aggregate asset securitization dummy										
	IO_Grey					IO_Indp				
	2006Q3	2006Q4	2007Q1	2007Q2	Pre-Crisis	2006Q3	2006Q4	2007Q1	2007Q2	Pre-Crisis
Observations	387	380	374	372	1,513	387	380	374	372	1,513
ATT	-1.759	-2.199	1.841	-1.147	-1.492	-8.204	-4.162	-4.631	-7.900	-5.000
T-value	-0.837	-0.925	0.847	-0.479	-1.237	-1.625	-0.932	-0.784	-1.256	-1.944*
Panel C. Mean difference in institutional ownership using PMBS dummy										
	IO_Grey					IO_Indp				
	2006Q3	2006Q4	2007Q1	2007Q2	Pre-Crisis	2006Q3	2006Q4	2007Q1	2007Q2	Pre-Crisis
Observations	387	380	374	372	1,513	387	380	374	372	1,513
ATT	-0.503	-0.660	-2.662	-1.265	-1.535	-0.320	-0.795	-2.468	2.112	0.464
T-value	-0.432	-0.501	-1.940*	-0.944	-2.090**	-0.151	-0.350	-1.062	0.981	0.398

Notes: In this table, we report the mean difference in institutional ownership between BHCs with high exposure to securitization and BHCs with no exposure to securitization using Propensity Score Matching. We examine each of the four quarters immediately prior to the crisis and the four-quarter period as a whole. In the first stage, we run Probit regression with one of the securitization measure dummies being the department variable, and all our control variables as independent variables along with date fixed effect. The three securitization dummies we use are: PMBSD, equals 1 if a BHC reports nonzero PMBS and 0 otherwise, SCT_MGGD, equals 1 if a BHC reports nonzero mortgage securitization and 0 otherwise; SCT_ALLD, equals 1 if a BHC reports nonzero aggregate asset securitization and 0 otherwise. We then conduct propensity score matching (PSM) based on the results we obtain from Probit regressions, using the nearest-neighbor and a caliper of 0.01. We conduct mean difference t-tests on grey institutional ownership and independent institutional ownership between the treated sample and matched sample for each of the 4 quarters prior to crisis as well as the whole year prior to crisis. To save space, we only report the mean difference here. Panel A provides the results using mortgage securitization dummy, Panel B provides the results using aggregate asset securitization dummy and Panel C provides the results using PMBS dummy. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

grey institutions sell significantly more BHCs reporting non-zero PMBS than they sell control group BHCs before the crisis with a difference in mean institutional ownership of 1.5%.

To further address the concern of endogeneity and reverse causality, we resort to instrumental variable (IV) regressions. Admittedly, it is challenging to find valid instrumental variables based on economic theory that predict a BHC's securitization decision but not its institutional ownership. Nevertheless, we choose five macroeconomic variables as our excluded instrumental variables: real disposable personal income, average number of households over the quarter, average number of marriages, and the average growth rate in the number of mortgage applications, and total deposits the BHC holds. Intuitively, we expect higher disposable income, higher number of households and number of marriages and faster growth in mortgage applications and lower deposits available would put more pressure on BHCs to securitize assets to meet the liquidity needs and loan demand.

We report the second-stage regression results in Table 2.5. From Column 1 through Column 3, we investigate the institutional ownership of grey institutions and from Column 4 through Column 6, we investigate the institutional ownership of independent institutions. The results again confirm that both grey and independent institutions significantly reduce their holdings of BHCs with high exposure to mortgage securitization and asset securitization before the crisis but only grey institutions significantly reduce their investment in BHCs with high exposure to the riskier PMBS. In addition, the overidentification tests cannot reject the null hypothesis that the excluded instruments are valid instruments, i.e., uncorrelated with the error term but is correlated with securitization measures.

Table 2.5 Institutional ownership and bank securitization: instrumental regression

VARIABLES	(1) IO_Grey	(2) IO_Grey	(3) IO_Grey	(4) IO_Indp	(5) IO_Indp	(6) IO_Indp
SCT_MGG_t	-0.743***			-1.074**		
	(0.228)			(0.467)		
SCT_ALL_t		-0.779***			-0.965**	
		(0.215)			(0.433)	
$PMBS_t$			-2.333***			0.914
			(0.669)			(1.130)
Z_SCORE_{t-1}	-1.782*	-2.175**	3.221**	-0.940	-1.154	-0.468
	(1.025)	(1.065)	(1.496)	(2.103)	(2.150)	(2.527)
LIQ_{t-1}	-0.018	-0.021	0.143***	0.032	0.031	-0.012
	(0.018)	(0.018)	(0.047)	(0.036)	(0.036)	(0.080)
PRF_{t-1}	1.665	1.366	3.182***	-3.990*	-4.025*	-1.590
	(1.017)	(1.044)	(0.999)	(2.087)	(2.108)	(1.688)
$LQLT_{t-1}$	1.688**	1.688***	-1.408**	-2.834**	-3.139**	-4.328***
	(0.659)	(0.633)	(0.713)	(1.351)	(1.279)	(1.205)
EQT_{t-1}	0.217***	0.368***	0.102	0.279	0.470**	0.356**
	(0.083)	(0.091)	(0.101)	(0.170)	(0.185)	(0.170)
$SIZE_{t-1}$	4.555***	4.611***	4.622***	7.107***	7.034***	5.822***
	(0.274)	(0.271)	(0.293)	(0.563)	(0.548)	(0.496)
$QRET_{t-1}$	-0.049**	-0.051**	-0.040*	-0.135***	-0.137***	-0.125***
	(0.021)	(0.022)	(0.024)	(0.044)	(0.044)	(0.040)
$QVOL_{t-1}$	0.389***	0.398***	0.173*	0.085	0.060	-0.161
	(0.098)	(0.097)	(0.092)	(0.201)	(0.196)	(0.155)
EFF_{t-1}	-6.965	16.932	-64.662	162.936*	180.654**	79.706
	(40.595)	(43.318)	(41.194)	(83.290)	(87.483)	(69.588)
DT_{t-1}	-0.864***	-0.693***	-0.844***	-1.258***	-1.047***	-1.268***
	(0.138)	(0.148)	(0.156)	(0.284)	(0.298)	(0.263)
DH_{t-1}	7.710**	12.721***	-1.565	22.948***	26.886***	6.376*
	(3.905)	(4.843)	(2.279)	(8.011)	(9.780)	(3.849)
$NONINC_{t-1}$	5.315*	5.345*	20.147***	-15.522***	-14.644**	-13.849*
	(2.851)	(2.826)	(4.226)	(5.850)	(5.708)	(7.139)
Constant	-61.996***	-64.295***	-65.317***	-86.503***	-87.386***	-67.709***
	(3.882)	(4.164)	(4.679)	(7.964)	(8.410)	(7.903)
Observations	1,137	1,137	1,137	1,137	1,137	1,137
R-squared	0.446	0.431	0.297	0.299	0.303	0.397
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes

(Table 2.5 continued)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	IO_Grey	IO_Grey	IO_Grey	IO_Indp	IO_Indp	IO_Indp
Sargan-Hansen Stat	3.563	0.641	1.666	0.388	0.752	1.671
P-Value	0.168	0.726	0.435	0.824	0.686	0.434

Notes: In this table, we provide the regression results using instrumental regression approach. In each of the regressions, we treat the securitization measures as endogenous variable. In the first-stage, we regress one of our securitization measure measures on the included control variables as well as four excluded instrument variables: DPINC, NHOUS, NMARR, GRMGGN, Deposit; and then we include the predicted values in the second-stage as independent variables along with other controls. DPINC is quarterly real disposable personal income; NHOUS is the average number of households over the quarter; NMARR is average number of marriages during the quarter; and GRMGGN is the average growth rate in the number of mortgage applications over the quarter and Deposit is total deposits over total assets. Descriptive statistics for the instrumental variables are provided in Appendix D. All other independent variables are as defined in Table 2.1. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

2.4.3 Institutional trading in BHCs prior to the 2008 Financial Crisis: banks and insurance companies

In our analysis so far, we include both banks and insurance companies in grey institutions. We use this section to investigate whether banks and insurance companies behave differently when investing in BHCs before the crisis. We report the results in Table 2.6. The selling in BHCs in general before the crisis documented in Table 2.3 seems to be dominated by "bank" type institutions. Though independent institutions reduce their holdings in BHCs with high-exposure to mortgage or asset securitization, both banks and insurance companies significantly reduce BHCs reporting high level of PMBS in each of the four quarters before the crisis hit. However, the magnitude appears to be larger for banks than for insurance companies.

2.4.4 Institutional ownership and deal quality

In last section, we have shown that institutional investors reduce their holdings in high-exposure BHCs before the crisis hit. In particular, the reduction of grey institution holdings is more profound in BHCs that report higher level of PMBS on their balance sheet. However, high securitization level doesn't necessarily lead to high risk or deterioration of balance sheet for a BHC if risk is appropriately

Table 2.6 Institutional ownership and BHC securitization for banks and insurance companies

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGG	SCG_ALL	PMBS	SCT_MGG	SCG_ALL	PMBS
Dependent Var:	IO_Banks	IO_Banks	IO_Banks	IO_IC	IO_IC	IO_IC
SCT_t	0.034**	0.032**	0.064	0.025***	0.037***	0.030
	(0.014)	(0.013)	(0.061)	(0.009)	(0.013)	(0.021)
Dummy [1 for 2006Q3]	0.130*	0.122	0.254***	0.102***	0.095***	0.142***
	(0.076)	(0.077)	(0.097)	(0.033)	(0.032)	(0.037)
Dummy [1 for 2006Q4]	0.748***	0.737***	0.872***	0.094**	0.093**	0.123***
	(0.114)	(0.115)	(0.127)	(0.041)	(0.041)	(0.045)
Dummy [1 for 2007Q1]	-0.469***	-0.476***	-0.359***	0.006	0.009	0.073
	(0.129)	(0.129)	(0.134)	(0.046)	(0.046)	(0.050)
Dummy [1 for 2007Q2]	-0.503***	-0.512***	-0.411***	-0.024	-0.026	0.071
	(0.091)	(0.091)	(0.099)	(0.043)	(0.044)	(0.047)
SCT_t *	-0.000	0.006	-0.123**	-0.041***	-0.028***	-0.078***
Dummy [1 for 2006Q3]	(0.023)	(0.020)	(0.056)	(0.013)	(0.010)	(0.021)
SCT_t *]	0.020	0.028	-0.108*	-0.032**	-0.023*	-0.061**
Dummy [1 for 2006Q4	(0.019)	(0.018)	(0.060)	(0.014)	(0.012)	(0.024)
SCT_t *	-0.011	0.003	-0.119**	-0.006	-0.006	-0.073***
Dummy [1 for 2007Q1]	(0.021)	(0.022)	(0.057)	(0.013)	(0.012)	(0.023)
SCT_t *	-0.021	-0.005	-0.107**	0.018	0.016	-0.079***
Dummy [1 for 2007Q2]	(0.026)	(0.025)	(0.051)	(0.013)	(0.013)	(0.024)
Z_SCORE_{t-1}	-0.036	-0.038	-0.041	-0.060	-0.060	-0.064
	(0.134)	(0.134)	(0.134)	(0.042)	(0.042)	(0.042)
LIQ_{t-1}	-0.011	-0.011	-0.013	-0.002	-0.002	-0.003
	(0.013)	(0.013)	(0.013)	(0.004)	(0.004)	(0.004)
PRF_{t-1}	0.183**	0.184**	0.181**	0.056***	0.057***	0.056***
	(0.072)	(0.072)	(0.072)	(0.018)	(0.018)	(0.018)
$LQLT_{t-1}$	-0.208***	-0.208***	-0.208***	-0.078***	-0.079***	-0.076***
	(0.068)	(0.068)	(0.069)	(0.021)	(0.021)	(0.020)
EQT_{t-1}	0.138***	0.137***	0.141***	0.025**	0.024*	0.027**

(Table 2.6 continued)

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGG	SCG_ALL	PMBS	SCT_MGG	SCG_ALL	PMBS
Dependent Var:	IO_Banks	IO_Banks	IO_Banks	IO_IC	IO_IC	IO_IC
	(0.041)	(0.041)	(0.041)	(0.012)	(0.012)	(0.012)
$SIZE_{t-1}$	1.990***	1.994***	1.999***	0.253**	0.255**	0.250**
	(0.344)	(0.342)	(0.343)	(0.119)	(0.117)	(0.121)
$QRET_{t-1}$	0.000	0.000	0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
$QVOL_{t-1}$	0.002	0.002	0.002	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
EFF_{t-1}	0.318	0.204	0.518	-2.209**	-2.388***	-2.086**
	(2.654)	(2.651)	(2.656)	(0.932)	(0.896)	(0.944)
DT_{t-1}	-0.337***	-0.331***	-0.329***	-0.163***	-0.161***	-0.157***
	(0.050)	(0.050)	(0.054)	(0.021)	(0.018)	(0.024)
DH_{t-1}	0.769	0.662	0.879	0.118	0.007	0.207
	(1.227)	(1.221)	(1.222)	(0.379)	(0.393)	(0.377)
$NONINC_{t-1}$	1.235	1.189	1.347	0.108	0.005	0.204
	(1.187)	(1.186)	(1.172)	(0.331)	(0.324)	(0.331)
Constant	-24.554***	-24.604***	-24.651***	-2.695	-2.745*	-2.644
	(4.824)	(4.804)	(4.824)	(1.687)	(1.663)	(1.714)
Observations	19,388	19,388	19,388	19,388	19,388	19,388
Number of BHCs	674	674	674	674	674	674
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.579	0.577	0.581	0.282	0.320	0.289

Notes: we presents the results from regressions of ownership of bank-type institutions and insurance company-type institutions on BHC risk measures, dummy variables for the 4 quarters leading up to the crisis, one of our securitization level measures, as well as the interactions of securitization measure and dummy variables. IO_Banks represents the aggregate ownership from bank-type institutional investors and IO_IC represents insurance company-type institutions. All independent variables are defined as in Table 2.1. To save space, we only provide the results using continuous securitization measures but provide the results using securitization dummies in the Appendix F. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

controlled when securitizing mortgages. To further capture BHCs' risk exposure to securitization activities, we re-examine the institutional ownership regressions by including mortgage securitization deal quality. We match sample BHCs with the securitization deals they issue in BBx data and collect five different deal quality measures for each matched deal: documentation level, loan sector, owner-occupancy, FIICO and combined loan-to-value (CLTV). The higher the first four measures, or the lower the last measure, the better the quality of a deal. Also after examining the data, we find that some deals are missing FICO or CLTV, we thus create two dummies to represent deals missing FICO or CLTV. Previous studies have found evidence that deals with missing critical quality information perform worse. The results are reported in Table 2.7.

We investigate grey and securitization deal quality in Panel A. The results suggest that grey institutions become more cautious about deal quality before the crisis and adjust their holdings accordingly. For example, they tilt their investment towards BHCs that issue deals with higher documentation and higher owner-occupied properties during the four quarters before the crisis. They also try to avoid BHCs that issue deals with missing FICO or CLTV.

In contrast, the results in Panel B show that independent institutions seem to be less informed about BHCs' risk exposure to the securitization deals these BHCs issue. Independent institutions move to BHCs that issue deals with lower documentation level, lower rating, lower owner-occupied properties and missing CLTV before the crisis. They also react positively to deals missing FICO score. Missing CLTV does affect independent institutional ownership negatively but its magnitude is smaller than the positive effect of missing CLTV during the pre-crisis period.

Table 2.7 Institutional ownership and securitization deal quality

Panel A. Grey institutions					
	(1)	(2)	(3)	(4)	(5)
DOC_{t-1}	-0.236				
	(0.172)				
DOC_{t-1} *[1, if 2006Q3 to 2007Q2]	1.979***				
	(0.376)				
$LSEC_{t-1}$		0.724***			
		(0.131)			
$LSEC_{t-1}$ *[1, if 2006Q3 to 2007Q2]		0.070			
		(0.415)			
$Owner_{t-1}$			-1.094***		
			(0.336)		
$Owner_{t-1}$ *[1, if 2006Q3 to 2007Q2]			2.769***		
			(0.773)		
$FICO_{t-1}$				-0.002	
				(0.002)	
$FICO_{t-1}$ *[1, if 2006Q3 to 2007Q2]				-0.008	
				(0.006)	
$MissFICO_{t-1}$				-3.695**	
				(1.635)	
$MissFICO_{t-1}$ *[1, if 2006Q3 to 2007Q2]				-5.135	
				(4.279)	
$CLTV_{t-1}$					0.059***
					(0.014)
$CLTV_{t-1}$ *[1, if 2006Q3 to 2007Q2]					-0.032
					(0.024)
$MissCLTV_{t-1}$					-1.614***
					(0.380)
$MissCLTV_{t-1}$ *[1, if 2006Q3 to 2007Q2]					-0.863
					(0.672)

(Table 2.7 continued)

	(1)	(2)	(3)	(4)	(5)
Dummy [1, if a deal was issued during 2006Q3 to 2007Q2]	-0.782	3.469***	1.621**	8.392**	6.388***
	(0.881)	(0.922)	(0.706)	(3.943)	(2.146)
$Issue\ Balance_t$	0.000***	-0.000	0.000***	0.000**	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Issue\ Balance_t$ *[1, if 2006Q3 to 2007Q2]	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	24.753***	19.102**	20.156***	39.712***	13.588*
	(7.941)	(7.502)	(7.643)	(7.898)	(7.801)
Observations	1,456	1,456	1,456	1,456	1,456
Adjusted R^2	0.665	0.664	0.661	0.689	0.664
Time Fixed	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes
Panel B. Independent institutions					
	(6)	(7)	(8)	(9)	(10)
DOC_{t-1}	0.001				
	(0.002)				
DOC_{t-1} *[1, if 2006Q3 to 2007Q2]	-0.018***				
	(0.005)				
$LSEC_{t-1}$		-0.001			
		(0.001)			
$LSEC_{t-1}$ *[1, if 2006Q3 to 2007Q2]		-0.017***			
		(0.004)			
$Owner_{t-1}$			0.022***		
			(0.004)		

(Table 2.7 continued)

	(6)	(7)	(8)	(9)	(10)
$Owner_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]			-0.058***		
			(0.014)		
$FICO_{t-1}$				0.000***	
				(0.000)	
$FICO_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]				-0.000	
				(0.000)	
$MissFICO_{t-1}$				0.036**	
				(0.014)	
$MissFICO_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]				0.045	
				(0.045)	
$CLTV_{t-1}$					-0.000
					(0.000)
$CLTV_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]					0.000
					(0.000)
$MissCLTV_{t-1}$					-0.009**
					(0.004)
$MissCLTV_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]					0.057***
					(0.009)
Dummy [1, if a deal was issued during 2006Q3 to 2007Q2]	0.034**	0.025***	0.035***	-0.004	-0.024
	(0.013)	(0.009)	(0.013)	(0.040)	(0.025)
$Issue\ Balance_t$	-0.000	-0.000	-0.000**	-0.000*	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Issue\ Balance_t$ ∗[1, if 2006Q3 to 2007Q2]	0.000	0.000***	0.000***	0.000*	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	1.047***	1.090***	1.063***	1.069***	1.091***
	(0.086)	(0.084)	(0.082)	(0.088)	(0.082)

(Table 2.7 continued)

	(6)	(7)	(8)	(9)	(10)
Observations	1,456	1,456	1,456	1,456	1,456
Adjusted R^2	0.972	0.972	0.973	0.972	0.974
Time Fixed	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes

Notes: In this table, we rerun the regressions of institutional ownership on various deal quality measures and control variables for grey institutions and independent institutions separately. Deal quality measures are from BBx Data. FICO is the average FICO score for all mortgages in one deal; DOC is the average documentation level for all loans in one deal; CLTV is the average combined loan-to-value for all mortgages in one deal; LSEC is the proportion of prime mortgages in the deal; Owner is the proportion of owner-occupied properties in the deal. For some deals, FICO information is missing, when this happens, we assign a value of 0 to such deals' FICOs and also create a dummy variable (MissFICO), which takes value of one for deals missing FICO and zero otherwise. For some deals, CLTV information is missing, in this case, we assign a value of 100 to these deals' CLTVs and also create a dummy variable (MissCLTV), which takes value of one for deals with no CLTV and zero otherwise. In Panel A, we examine the ownership of grey institutions; and in Panel B, we examine the ownership of independent institutions. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different years. To save space, we do not report the coefficients on control variables. The results separating banks and insurance companies are provided in Appendix G. We cluster standard error at BHC level to allow for intragroup correlation. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

2.4.5 Event study of Lehman Brothers Bankruptcy and ex post profitability

Our results so far suggest that both grey and independent institutions reduce their holdings in high-exposure BHCs prior to the crisis. However, grey institutions with their potential business ties with the BHCs as well as their experience in similar business lines to BHCs show greater concern than independent institutions. We interpret the observed difference as grey institutions are better informed than independent institutions in terms of the risk exposure of the banks they invest. However, one may argue that independent institutions are not necessarily less informed, instead they actively seek risk in hope of picking mis-priced banks/secrutization deals for higer returns. In this subsection, we provide additional tests on whether grey institutions indeed have more information about BHCs than do independent institutions.

We investigate whether institutional trading over the four quarters leading up to the crisis can predict the BHCs' abnormal returns for the 3-day window around Lehman Brothers bankruptcy. We take Lehman Brothers bankruptcy as the one of the clearest signals of the housing market meltdown and excessive risk-taking in securitization deals. If institutional investors have anticipated the crisis and are able to identify the BHCs that were more aggressive in securitizing assets, their tradings in these BHCs should predict the BHCs' stock performance around the event. We thus regress abnormal stock returns around Lehman bankruptcy on institutional tradings prior to the crisis and their interaction terms with BHCs' exposure to securitization before the crisis.

Panel A of Table 2.8 reports the regression results of BHCs' abnormal event returns on institutional trading as well as their interaction terms with PMBS trading. If institutions have sold BHCs that are expected to perform worse during the Lehman event, we should expect positive coefficients on the pre-crisis trading. We find that the tradings of both grey institutions and independent institutions before the crisis have some predicting power on BHCs' stock performance

around Lehman bankruptcy. However, the trading of grey institutions can better predict high-exposure BHCs' stock performance. For example, two interaction terms between grey institutional trading and mortgage securitization measure turn out to be positive and significant during the pre-crisis period, one interaction terms between grey institutional trading and aggregate asset securitization measure turns out to positive and significant during the pre-crisis period, and two interaction terms between grey institutional trading and private-label MBS turn out to positive and significant. In comparison, only one interaction term of independent institutional trading and PMBS turns out to be positive and significant while one interaction term of independent institutional trading and aggregate asset securitization is actually negative and significant.

Panel B reports the one-year long term abnormal stock performance of BHCs following the Lehman event. If the trading of any types of institutions is driven by information they possess instead of the negative liquidity shock they experience, we should not observe any reversal in the long-run. Though the trading of grey institution in high-exposure BHCs during 2006Q3 is negative and significant with mortgage and aggregate securitization measure, we see more positive and significant coefficients in later quarters. The results suggest not only there's no strong evidence for price reversal based on grey institutional tradings before the crisis, their tradings during the pre-crisis period are actually further confirmed by the long-run performance.

As an additional robustness check of the information hypothesis, we also examine BHCs' operating performance (ROA) during crisis in Table 2.9. Again, the tradings of grey institutions on high exposure BHCs have better predicted power than those of independent institutions. However, grey institutions do not appear to know low exposure BHCs better than do independent institutions as none of the stand-alone trading terms turn out to be significant for grey institutions while one stand-alone trading term is positive and significant for independent institutions. The

Table 2.8 Pre-crisis institutional trading and stock return around Lehman Brothers Bankruptcy

Panel A. Abnormal returns around Lehman Bankruptcy (-1 day, +1 day)						
	(1)	(2)	(3)	(4)	(5)	(6)
		Grey institutions			Independent institution	
VARIABLES	SCT_MGG	SCT_ALL	PMBS	SCT_MGG	SCT_ALL	PMBS
$SCT_{precrisis}$	-0.068	0.047**	0.138**	0.031*	0.029	0.068
	(0.048)	(0.019)	(0.058)	(0.018)	(0.018)	(0.079)
CHGIO_2006Q3	-0.000	-0.000	-0.003	-0.003	-0.003	-0.006**
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
CHGIO_2006Q4	0.014***	0.014***	0.015***	0.002	0.003	0.004
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)
CHGIO_2007Q1	0.001	0.000	-0.001	0.006**	0.007***	0.007**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
CHGIO_2007Q2	0.004**	0.004**	0.004**	0.003*	0.003*	0.003*
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
$SCT_{precrisis}$ *	0.014	-0.029	0.071**	0.013	0.014	0.090*
CHGIO_2006Q3	(0.027)	(0.020)	(0.032)	(0.015)	(0.014)	(0.047)
$SCT_{precrisis}$*	0.056**	-0.010	0.005	-0.010	-0.006**	-0.026
CHGIO_2006Q4	(0.027)	(0.013)	(0.036)	(0.016)	(0.003)	(0.029)
$SCT_{precrisis}$*	0.026	0.030**	0.075*	-0.024	-0.020	-0.025
CHGIO_2007Q1	(0.018)	(0.015)	(0.040)	(0.027)	(0.013)	(0.025)
$SCT_{precrisis}$*	0.019**	0.008	0.031	0.019	0.012	0.002
CHGIO_2007Q2	(0.008)	(0.006)	(0.025)	(0.030)	(0.012)	(0.016)
Constant	0.026***	0.025***	0.023***	0.029***	0.028***	0.028***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	327	327	327	327	327	327
Adjusted R^2	0.129	0.137	0.138	0.087	0.095	0.099

(Table 2.8 continued)

Panel B. Post-Lehman Bankruptcy long run performance (0, +12 months)						
	(1)	(2)	(3)	(4)	(5)	(6)
		Grey institutions			Independent institutions	
VARIABLES	SCT_MGG	SCT_ALL	PMBS	SCT_MGG	SCT_ALL	PMBS
$SCT_{precrisis}$	0.204	-0.313**	0.174	-0.438**	-0.363*	-0.266
	(0.525)	(0.157)	(0.582)	(0.206)	(0.184)	(0.899)
CHGIO_2006Q3	-0.007	-0.007	-0.038	0.016	0.017	0.031
	(0.030)	(0.030)	(0.036)	(0.032)	(0.032)	(0.037)
CHGIO_2006Q4	-0.042	-0.047	-0.034	0.004	0.002	0.001
	(0.048)	(0.048)	(0.054)	(0.018)	(0.019)	(0.021)
CHGIO_2007Q1	0.033	0.030	0.030	-0.037*	-0.038*	-0.030
	(0.047)	(0.047)	(0.050)	(0.023)	(0.023)	(0.025)
CHGIO_2007Q2	-0.042	-0.042	-0.047*	-0.033*	-0.033*	-0.027*
	(0.026)	(0.026)	(0.025)	(0.017)	(0.017)	(0.016)
$SCT_{precrisis}$ *	-0.903***	-0.461*	0.610	0.009	-0.034	-0.235
CHGIO_2006Q3	(0.211)	(0.260)	(0.382)	(0.122)	(0.119)	(0.485)
$SCT_{precrisis}$*	-0.345	0.032	-0.329	-0.059	-0.002	0.118
CHGIO_2006Q4	(0.260)	(0.164)	(0.441)	(0.229)	(0.028)	(0.314)
$SCT_{precrisis}$*	0.470***	0.340**	0.175	-0.200	-0.108	-0.151
CHGIO_2007Q1	(0.156)	(0.132)	(0.427)	(0.287)	(0.118)	(0.289)
$SCT_{precrisis}$*	0.073	0.104**	0.334	0.258	0.173	-0.241
CHGIO_2007Q2	(0.072)	(0.052)	(0.224)	(0.361)	(0.135)	(0.201)
Constant	0.085	0.089*	0.079	0.080	0.081	0.079
	(0.053)	(0.053)	(0.059)	(0.060)	(0.061)	(0.063)
Observations	327	327	327	327	327	327
Adjusted R^2	0.050	0.044	0.041	0.044	0.043	0.046

Notes: In this table we report the regression results of BHCs' abnormal returns for the 3-day window around Lehman Brothers bankruptcy on September 15, 2008 on institutional trading in the four quarters leading up to the crisis. We use Carhart 4 factor model to estimate the cumulative abnormal returns for each BHC during the 3-day event window. Panel A reports the results using abnormal stock returns over the 3-day event window; and Panel B reports the results with one year long-run stock performance being the dependent variables. The results separating banks and insurance companies are provided in Appendix H. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

results on BHC operating performance provide additional support on the hypothesis that grey institutions know high-exposure BHCs better.

Table 2.9 Pre-crisis institutional trading and BHC operating performance during crisis

VARIABLES	(1) Grey	(2) Independent
$PMBS_{precrisis}$	18.442**	35.400***
	(8.444)	(11.179)
CHGIO_2006Q3	-0.176	0.174
	(0.321)	(0.194)
CHGIO_2006Q4	-0.600	0.063
	(0.367)	(0.194)
CHGIO_2007Q1	-0.329	-0.004
	(0.354)	(0.187)
CHGIO_2007Q2	-0.017	0.204*
	(0.179)	(0.115)
$PMBS_{precrisis}$ ∗CHGIO_2006Q3	-3.686	-6.149**
	(6.229)	(2.552)
$PMBS_{precrisis}$ ∗CHGIO_2006Q4	12.606**	-2.864
	(5.652)	(4.289)
$PMBS_{precrisis}$ ∗CHGIO_2007Q1	2.366	-3.978
	(5.968)	(3.261)
$PMBS_{precrisis}$ ∗CHGIO_2007Q2	12.512**	-2.515
	(5.958)	(2.082)
Constant	0.832**	0.528
	(0.367)	(0.437)
Observations	396	396

(Table 2.9 continued)

VARIABLES	(1) Grey	(2) Independent
Adjusted R^2	0.451	0.342

Notes: this table reports the regression results of cumulative ROA during the crisis on institutional trading over the four quarters leading to the crisis. The cumulative ROA is calculated as the sum of net income over the crisis period divided by the average size of the BHC during the same period. In the regressions, we also include the interaction terms of institutional trading with private-label MBS (PMBS) from the pre-crisis period. In order to capture potential future losses related to the crisis, we use a longer period from the third quarter of 2007 to the second quarter of 2009. The results using two different crisis definitions are reported in the first two columns and last two columns, respectively. The results separating banks and insurance companies are provided in Appendix I. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

2.5 Conclusion

In this paper, we test whether institutional investors have better information about the BHCs they invest. We use the 2008 financial crisis as a major event and examine how institutional investors trade in BHCs around the crisis. We divide BHCs into high-exposure BHCs and low-exposure BHCs based on their involvement in securitization. We supplement BHCs' aggregate securitization level from FR Y-9C with detailed securitization deal quality measures from BBx Data, which contains more than 7,400 private label mortgage securitized deals.

We find that grey institutions can better identify high-exposure BHCs and reduce their holdings more in such BHCs than independent institutions during the four quarters prior to the crisis. When we confine the analysis to only securitizing BHCs, we find that grey institutions prefer BHCs that issue deals of better quality. In contrast, independent institutions appear to be more aggressive before the crisis as they tilt their investment towards BHCs that issue riskier securitization deals over the same period.

Lastly, the trading of both grey institutions and independent institutions immediately before the crisis have some power in predicting BHCs' event day returns surrounding the Lehman Bankruptcy, but grey institutions does a much better job in predicting event returns for high-exposure BHCs. The pre-crisis trading of grey institutions is also positively related to operating performance of high-exposure BHCs during the crisis. Overall, our findings suggest that it is unlikely to rely on independent institutions to provide information on BHCs. Although, through their trades, grey institutions have revealed perverse information on some high exposure BHCs prior to the crisis. The magnitude does not appear to be economically strong enough as a pre-warning signal. In sum, our analysis demonstrate that there were concerned institutions regarding the risk-taking behaviors of BHCs prior to the crisis. However, it is not systematic among institutions to delegate them a monitoring role in the banking industry.

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Appendix A: Definitions of Variables

BHC-level variables

We obtain consolidated financial information of bank holding companies (BHCs) from the FR Y-9C reports from the Federal Reserve Bank of Chicago (FRB Chicago). Federal Reserve Bank of New York provides PERMCO_RSSD links from January 1, 1990 to September 30, 2012[13]. We use this linking table to collect PERMCOs for our sample BHCs and then we obtain stock return information of BHCs from CRSP. The expressions in parentheses denote the corresponding variable names in the FR Y-9C.

- Size is natural logarithm of total assets (BHCK2170).
- LIQ measures a BHC's balance sheet liquidity, it's calculated as liquid assets over total assets. Liquid assets equals the sum of Fed funds sold and securities purchased under agreements to resell (BHCK1350), securities held to maturity (BHCK1754), and available for sale securities (BHCK1773) for the period up to 2001Q4. For the period starting from 2002Q1, liquid assets equals the sum of BHCKC225, BHCK1754, and BHCK1773. From the first quarter of 2002, we use BHCKC225 to account for Fed funds sold and securities purchased under agreements to resell.
- PRF measures a BHC's profitability, it's calculated as net income (BHCK4340) over total assets (BHCK2170).
- EQT is equity ratio, calculated as equity capital (BHCK3210) over total assets (BHCK2170).
- EFF is BHC efficiency measures, it's calculated as noninterest expenses over total assets (BHCK2170).

[13] "Federal Reserve Bank of New York. 2013. *CRSP-FRB Link*."

- DT is total gross notional amount of derivative contracts held for trading, obtained adding the values of interest rate contracts (BHCKA126), foreign exchange contracts (BHCKA127), equity derivative contracts (BHCK8723), and commodity and other contracts (BHCK8724) over total assets.
- DH is total value of derivatives used for hedging purposes (sum of BHCK8725, BHCK8726, BHCK8727, and BHCK8728) over total assets.
- NONINC is the ratio of noninterest income (BHCK4079) over the sum of noninterest and interest income (BHCK4079+BHCK4107).
- LQLT measures a BHC's loan quality, it's calculated as the sum of loans past due 90 days or more (BHCK5525) and loans not accruing (BHCK5526) over total assets.
- PMBS, private MBS: the total value of private-label mortgage-backed securities held in both trading and investment portfolios; it excludes mortgage-backed securities that are either issued or guaranteed by government sponsored enterprises. It is calculated as the sum of BHCK1709, BHCK1733, BHCK1713, BHCK1736 and BHCK3536.
- SCT_MGG, the amount of mortgage securitized over total assets. The amount of mortgage securitized is obtained by adding outstanding principal balance of assets sold and securitized with recourse or other seller-provided credit enhancements – home equity lines (BHCKB706) and 1-4 family residential loans (BHCKB705).
- SCT_ALL, the sum of all securitized assets over total assets. All securitized assets value is obtained by adding the values of outstanding principal balance of assets sold and securitized with recourse or other seller-provided credit enhancements from the following six categories: 1-4 family residential loans (BHCKB705), home equity lines

(BHCKB706), credit card receivables (BHCKB707), auto loans (BHCKB708), other consumer loans (BHCKB709), and commercial and industrial loans (BHCKB710).

- Z-score. It equals the return on assets (PRF) plus the capital asset ratio (EQT) divided by the standard deviation of asset returns. It captures the number of standard deviations that profits must fall to derive a BHC into insolvency.
- QRET is compounded stock return over the quarter using daily return data.
- QVOL is quarterly return volatility, calculated as the variance of daily returns over the quarter.

Institutional ownership measures

We obtain institutional holding data from Thomson-Reuters Institutional Holdings (13f) The Thomson sets are available on WRDS as part of the Thomson Financial Network (TFN). Thomson Financial Spectrum classifies institutions into five types: 1) banks; 2) insurance companies; 3) investment companies and their managers; 4) independent investment advisers; and 5) others (pension funds, endowments, etc.). Following Chen, Harford, and Li (2007), we classify types 3 and 4 as well as public pension funds from type 5 as independent institutions; and types 1 and 2 as well as the remaining institutions from type 5 as grey institutions.

- IO_Total, total institutional ownership. It's calculated as the ratio of a BHC's total shares held by 13f investors over the BHC's total shares outstanding.
- IO_Grey, total institutional ownership from grey institutions. It's calculated as the ratio of a BHC's total shares held by grey institutions over the BHC's total shares outstanding.
- IO_Indp, total institutional ownership from independent institutions. It's calculated as the ratio of a BHC's total shares held by independent institutions over the BHC's total shares outstanding.

- CHGIO_Total, the change in total institutional ownership from previous quarter for the BHC.
- CHGIO_Grey, the change in grey institutional ownership from previous quarter for the BHC.
- CHGIO_Indp, the change in independent institutional ownership from previous quarter for the BHC.

Deal quality measures

We collect various quality measures of securitized mortgage deals from BBx database provided by BlackBox Logic. $\boldsymbol{BBx\ Data^{TM}}$ includes more than 7,400 deals, 21 million loans and over 740 million remittance records dating back to 1999.

- FICO: the average FICO score for all loans in the deal. If a deal doesn't have FICO score information, we assign a value of 0 to the FICO score of for such deals.
- MissFICO. Dummy variable that takes 1 for deals with missing FICO score and 0 otherwise.
- DOC: average documentation level for all loans in the deal. For each mortgage, BBx reports one of the documentation status, "Full Documentation (FD)", "Low Documentation (LD)", "No Documentation (ND)", "Reduced Documentation (RD)" and "Unknown (UN)". We assign a value of 1 to mortgages with ND or UN, a value of 2 to mortgages with RD or LD, and a value of 3 to mortgages with FD. We then compute the average documentation level of all mortgages included in one deal as the deal's average documentation level.
- CLTV: combined loan-to-value. BBx reports the ratio of all loan amounts on the property at the time of origination to the property value at loan origination for each mortgage. We

compute the mean value of all mortgages include in one deal as deal's average CLTV. If a deal doesn't have CLTV information, we assign a 100% CLTV to such deals.

- MissCLTV. Dummy variable that takes 1 for deals with no CLTV information and 0 otherwise.
- LSEC: proportion of prime mortgages in the deal. BBx reports the credit sector each mortgage belongs, including "Alt-A (AA)", "Prime (PR)", "Subprime (SP)", and "Unknown (UN)". We assign a value of 1 to mortgages with UN or SP, a value of 2 to mortgages with AA, and a value of 3 to mortgages with PR. Then we compute the average value of all mortgages in one deal as the deal's average loan sector, the higher the value the higher portion of prime mortgages in the deal.
- Owner: owner occupancy status. BBx provides occupancy types: "Non Owner Occupied", "Other", "Owner Occupied", "Second Home", "Unknown" and "Vacant". We assign a value of 1 to mortgages recorded as "Owner Occupied" and a value of 0 to the rest mortgages. We then compute the average value of all mortgages in one deal as the deal's average owner-occupancy. The higher the value, the more properties are owner-occupied in the deal.
- Issue year: the calendar year the deal was formed.
- Issue Balance: the average issuing balance for the deal.

Appendix B: List of Public Pension Funds

MGRNAME	MGRNO
California Public Employees Retirement System	12000
California State Teachers Retirement	12120
California State Teachers Retirement	12100
Colorado Public Employees Retirement Association	18740
Florida State Board of Administration	38330
Illinois State Universities Retirement System	81590
Kentucky Teachers Retirement System	49050
Maryland State Retirement and Pension System	54360
Michigan State Treasury	57500
Montana Board of Investment	58650
New Mexico Edu Retirement BD	63600
New York State Common Retirement Fund	63850
New York State Teachers Retirement System	63895
Ohio Public Employees Retirement System	66550
Ohio School Employees Retirement System	66610
Ohio State Teachers Retirement System	66635
Texas Teachers Retirement System	83360
Texas Teachers Retirement System	82895
Virginia Retirement System	90803
State of Wisconsin Investment Board	93405
Missouri ST Emp Ret SYS	58150
Pennsylvania Public SCH EMP RE	68830

Notes: These public pension funds are collectively identified in Cremers and Nair (2005), Larcker, Richardson, and Tuna (2005), and Dittmar and Mahrt-Smith (2007). The first column provides names of public pension funds; and second column provides manager numbers in Thomson-Reuters Institutional Holdings (13f).

Appendix C. Securitization Deal Issuing BHCs and the Number of Deals They Issued

	RSSDID	BHC Name	# Deals
1	1039502	J P MORGAN CHASE & CO	202
2	1068025	KEYCORP NEW	2
3	1068294	BANK ONE CORP	3
4	1068762	MELLON FINL CORP	3
5	1069125	NATIONAL CITY CORP	2
6	1069778	PNC FINL SVCS GROUP INC	1
7	1070617	PROVIDENT FINL GROUP INC	2
8	1073551	WACHOVIA CORP 2ND NEW	4
9	1073757	BANK OF AMERICA CORPORATION	280
10	1094640	FIRST TENN NATL CORP	161
11	1120754	WELLS FARGO & CO NEW	280
12	1129382	POPULAR INC	29
13	1131787	SUNTRUST BKS INC	1
14	1888193	WILMINGTON TRUST CORP	15
15	1951350	CITIGROUP INC	112
16	2081124	GREENPOINT FINL CORP	3
17	2277860	CAPITAL ONE FINL CORP	59
18	2549857	COUNTRYWIDE CR INDS INC DEL	648

Notes: This table provides the names and RSSDID of mortgage securitization deal issuers, along with the number of deals they issue during our sample period.

Appendix D. Descriptive Statistic for Instrument Variables

Variable	Mean	Median	Std Dev	25th Pctl	75th Pctl	N
NHOUS	110,983	110,937.8	291.295	110,747	111,219	4
NMARR	182.417	184.667	38.801	150.833	214	4
DPINC	35,716	35,806	245.7	35,548.5	35,883.5	4
GRMGGN	1.181	0.531	3.579	-1.296	3.658	4
Deposits	0.747	0.765	0.099	0.699	0.814	1631

Notes: This table reports the descriptive statistics for instrument variables over the pre-crisis period. DPINC is quarterly real disposable personal income; NHOUS is the average number of households over the quarter in thousands; NMARR is average number of marriages during the quarter in thousands; and GRMGGN is the average growth rate in the number of mortgage applications over the quarter. All the four variables are estimated from data series reported in HIS Global Insight. Loans is total loans over total assets, calculated as BHCK2122/BHCK2170; Deposits is total deposits over total assets, calculated as the sum of BHDM6631, BHDM6636, BHFN6631, BHFN6636 over BHCK217. Data for these two variables is from FR Y-9C.

Appendix E. Grey Institutional Ownership and BHC Exposure to Securitization (Definition 2)

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGG	SCG_ALL	PMBS	SCT_MGG	SCG_ALL	PMBS
Dependent Var:	IO_Grey	IO_Grey	IO_Grey	IO_Indp	IO_Indp	IO_Indp
SCT_t	0.043	0.031	-0.187**	0.426	0.245	-0.727**
	(0.029)	(0.026)	(0.094)	(0.697)	(0.631)	(0.368)
Dummy [1 for 2006Q3]	0.542***	0.557***	0.648***	0.679***	0.682***	0.845***
	(0.134)	(0.135)	(0.154)	(0.152)	(0.155)	(0.245)
Dummy [1 for 2006Q4]	1.131***	1.148***	1.258***	1.217***	1.217***	1.209***
	(0.185)	(0.186)	(0.203)	(0.198)	(0.201)	(0.288)
Dummy [1 for 2007Q1]	-1.030***	-1.006***	-0.934***	-0.848***	-0.828***	-0.842***
	(0.208)	(0.210)	(0.219)	(0.211)	(0.216)	(0.278)
Dummy [1 for 2007Q2]	-0.780***	-0.758***	-0.570***	-0.600***	-0.607***	-0.853***
	(0.171)	(0.175)	(0.213)	(0.183)	(0.190)	(0.285)
SCT_t ∗Dummy [1 for 2006Q3]	-0.103***	-0.092***	-0.190***	-2.355***	-2.062***	-0.804**
	(0.034)	(0.027)	(0.071)	(0.685)	(0.642)	(0.399)
SCT_t ∗ Dummy [1 for 2006Q4]	-0.054	-0.058*	-0.169**	-1.442*	-1.252*	-0.277
	(0.034)	(0.031)	(0.081)	(0.816)	(0.750)	(0.422)
SCT_t ∗Dummy [1 for 2007Q1]	-0.069	-0.076	-0.143*	-2.671***	-2.441***	-0.602
	(0.057)	(0.048)	(0.084)	(0.940)	(0.851)	(0.429)
SCT_t ∗Dummy [1 for 2007Q2]	0.103	0.061	-0.116	-1.132	-0.840	0.318
	(0.148)	(0.125)	(0.076)	(1.232)	(1.058)	(0.473)
Z_SCORE_{t-1}	-0.085	-0.090	-0.085	-0.089	-0.091	-0.079
	(0.262)	(0.262)	(0.262)	(0.262)	(0.262)	(0.264)
LIQ_{t-1}	0.044*	0.044*	0.050*	0.044*	0.044*	0.046*
	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)	(0.025)
PRF_{t-1}	0.203*	0.204*	0.209*	0.201	0.204*	0.210*

	(0.123)	(0.123)	(0.123)	(0.123)	(0.123)	(0.122)
$LQLT_{t-1}$	-0.116	-0.116	-0.102	-0.119	-0.117	-0.110
	(0.147)	(0.148)	(0.148)	(0.148)	(0.148)	(0.147)
EQT_{t-1}	0.569***	0.569***	0.573***	0.571***	0.571***	0.568***
	(0.083)	(0.083)	(0.083)	(0.083)	(0.083)	(0.083)
$SIZE_{t-1}$	3.397***	3.397***	3.338***	3.379***	3.383***	3.444***
	(0.614)	(0.615)	(0.620)	(0.620)	(0.618)	(0.613)
$QRET_{t-1}$	-0.004**	-0.004**	-0.005**	-0.004**	-0.004**	-0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
$QVOL_{t-1}$	-0.014***	-0.014***	-0.013***	-0.014***	-0.014***	-0.014***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
EFF_{t-1}	7.479*	7.456*	7.594*	7.626*	7.609*	8.500**
	(4.064)	(4.077)	(4.025)	(4.049)	(4.072)	(4.045)
DT_{t-1}	-0.322***	-0.317***	-0.309***	-0.319***	-0.318***	-0.335***
	(0.092)	(0.094)	(0.096)	(0.097)	(0.097)	(0.098)
DH_{t-1}	-0.613	-0.595	-0.430	-0.544	-0.511	-0.362
	(1.673)	(1.681)	(1.717)	(1.670)	(1.666)	(1.677)
$NONINC_{t-1}$	1.983	1.954	2.171	2.081	2.064	2.020
	(2.287)	(2.288)	(2.330)	(2.311)	(2.309)	(2.323)
Constant	-47.663***	-47.645***	-46.833***	-47.403***	-47.448***	-47.974***
	(8.654)	(8.669)	(8.744)	(8.730)	(8.711)	(8.681)
Observations	19,388	19,388	19,388	19,388	19,388	19,388
Number of BHCs	674	674	674	674	674	674
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.621	0.621	0.612	0.619	0.619	0.618

Notes: We presents the results from regressions of grey institutional ownership on BHC risk measures, dummy variables for the 4 quarters leading up to the crisis, one of our securitization level measures, as well as the interactions of securitization measure and dummy variables. In this table, we define grey institutions as banks, insurance companies and all non-public pension funds in "Type 5" institutions. All independent variables are defined as in Table 3. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different years. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

Appendix F. Institutional Ownership and BHC Securitization Exposure Using Dummy Variables

	(1)	(2)	(3)	(4)	(5)	(6)
SCT_t:	SCT_MGGD	SCG_ALLD	PMBSD	SCT_MGGD	SCG_ALLD	PMBSD
Dependent Variable:	IO_Banks	IO_Banks	IO_Banks	IO_IC	IO_IC	IO_IC
SCT_t	0.361	0.388	0.378*	0.153	0.199*	0.104*
	(0.496)	(0.445)	(0.208)	(0.146)	(0.103)	(0.057)
Dummy [1 for 2006Q3]	0.150*	0.157*	0.299**	0.130***	0.122***	0.218***
	(0.086)	(0.088)	(0.126)	(0.036)	(0.039)	(0.056)
Dummy [1 for 2006Q4]	0.728***	0.726***	0.674***	0.108**	0.097**	0.230***
	(0.122)	(0.125)	(0.162)	(0.043)	(0.044)	(0.060)
Dummy [1 for 2007Q1]	-0.459***	-0.460***	-0.358**	0.028	0.018	0.197***
	(0.130)	(0.135)	(0.172)	(0.047)	(0.046)	(0.065)
Dummy [1 for 2007Q2]	-0.491***	-0.511***	-0.596***	-0.018	-0.031	0.077
	(0.095)	(0.101)	(0.153)	(0.046)	(0.048)	(0.063)
SCT_t ∗Dummy [1 for 2006Q3]	-0.188	-0.215	-0.354	-0.674***	-0.503**	-0.319***
	(0.418)	(0.383)	(0.224)	(0.206)	(0.211)	(0.096)
SCT_t ∗ Dummy [1 for 2006Q4]	0.465	0.413	0.195	-0.464*	-0.289	-0.349***
	(0.520)	(0.478)	(0.265)	(0.248)	(0.245)	(0.099)
SCT_t ∗Dummy [1 for 2007Q1]	-0.188	-0.148	-0.218	-0.295	-0.150	-0.415***
	(0.527)	(0.480)	(0.246)	(0.245)	(0.240)	(0.105)
SCT_t ∗Dummy [1 for 2007Q2]	-0.286	-0.052	0.179	0.115	0.205	-0.175*
	(0.491)	(0.504)	(0.249)	(0.223)	(0.214)	(0.105)
Z_SCORE_{t-1}	-0.043	-0.043	-0.049	-0.064	-0.065	-0.066
	(0.134)	(0.134)	(0.133)	(0.042)	(0.042)	(0.042)
LIQ_{t-1}	-0.011	-0.011	-0.013	-0.003	-0.003	-0.003

	(0.013)	(0.013)	(0.013)	(0.004)	(0.004)	(0.004)
PRF_{t-1}	0.182**	0.184**	0.182**	0.056***	0.057***	0.056***
	(0.072)	(0.072)	(0.072)	(0.018)	(0.018)	(0.018)
$LQLT_{t-1}$	-0.209***	-0.208***	-0.208***	-0.078***	-0.078***	-0.076***
	(0.069)	(0.069)	(0.069)	(0.020)	(0.020)	(0.020)
EQT_{t-1}	0.140***	0.140***	0.141***	0.026**	0.027**	0.027**
	(0.041)	(0.041)	(0.040)	(0.012)	(0.012)	(0.012)
$SIZE_{t-1}$	1.972***	1.966***	1.961***	0.243**	0.237*	0.240**
	(0.349)	(0.348)	(0.343)	(0.120)	(0.121)	(0.121)
$QRET_{t-1}$	-0.000	-0.000	0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
$QVOL_{t-1}$	0.002	0.002	0.002	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
EFF_{t-1}	0.438	0.444	0.026	-2.105**	-2.111**	-2.223**
	(2.657)	(2.653)	(2.697)	(0.940)	(0.937)	(0.951)
DT_{t-1}	-0.330***	-0.330***	-0.319***	-0.159***	-0.158***	-0.155***
	(0.055)	(0.055)	(0.054)	(0.024)	(0.024)	(0.024)
DH_{t-1}	0.805	0.822	0.765	0.167	0.173	0.176
	(1.244)	(1.240)	(1.222)	(0.392)	(0.391)	(0.388)
$NONINC_{t-1}$	1.312	1.291	1.410	0.183	0.170	0.223
	(1.187)	(1.176)	(1.175)	(0.336)	(0.334)	(0.330)
Constant	-24.286***	-24.218***	-24.252***	-2.538	-2.462	-2.527
	(4.893)	(4.885)	(4.811)	(1.705)	(1.716)	(1.705)
Observations	19,388	19,388	19,388	19,388	19,388	19,388
Number of BHCs	674	674	674	674	674	674
Date Fixed	Yes	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.580	0.580	0.580	0.286	0.292	0.280

Appendix G Institutional Ownership and Securitization Deal Quality: Banks and Insurance Companies

Panel A. Banks					
	(1)	(2)	(3)	(4)	(5)
DOC_{t-1}	-0.001				
	(0.001)				
DOC_{t-1} ∗[1, if 2006Q3 to 2007Q2]	0.013***				
	(0.003)				
$LSEC_{t-1}$		0.006***			
		(0.001)			
$LSEC_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]		0.002			
		(0.003)			
$Owner_{t-1}$			-0.009***		
			(0.003)		
$Owner_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]			0.023***		
			(0.006)		
$FICO_{t-1}$				-0.000	
				(0.000)	
$FICO_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]				-0.000	
				(0.000)	
$MissFICO_{t-1}$				-0.036***	
				(0.014)	
$MissFICO_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]				-0.032	
				(0.032)	
$CLTV_{t-1}$					0.001***
					(0.000)
$CLTV_{t-1}$ ∗[1, if 2006Q3 to 2007Q2]					-0.000**

					(0.000)
$MissCLTV_{t-1}$					-0.012***
					(0.003)
$MissCLTV_{t-1}$ *[1, if 2006Q3 to 2007Q2]					-0.007
					(0.005)
Dummy [1, if a deal was issued during 2006Q3 to 2007Q2]	-0.002	0.022***	0.009	0.052*	0.064***
	(0.007)	(0.007)	(0.006)	(0.029)	(0.016)
$Issue\ Balance_t$	0.000***	0.000	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Issue\ Balance_t$ *[1, if 2006Q3 to 2007Q2]	-0.000***	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.132**	0.102*	0.110*	0.286***	0.042
	(0.062)	(0.059)	(0.060)	(0.061)	(0.061)
Observations	1,456	1,456	1,456	1,456	1,456
Adjusted R^2	0.661	0.665	0.660	0.695	0.666
Time Fixed	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes

Panel B. Insurance companies

	(1)	(2)	(3)	(4)	(5)
DOC_{t-1}	-0.002**				
	(0.001)				
DOC_{t-1} *[1, if 2006Q3 to 2007Q2]	0.007***				
	(0.001)				
$LSEC_{t-1}$		0.001*			
		(0.000)			

$LSEC_{t-1}$ *[1, if 2006Q3 to 2007Q2]		-0.001			
		(0.001)			
$Owner_{t-1}$			-0.002*		
			(0.001)		
$Owner_{t-1}$ *[1, if 2006Q3 to 2007Q2]			0.005		
			(0.003)		
$FICO_{t-1}$				0.000	
				(0.000)	
$FICO_{t-1}$ *[1, if 2006Q3 to 2007Q2]				-0.000	
				(0.000)	
$MissFICO_{t-1}$				-0.002	
				(0.005)	
$MissFICO_{t-1}$ *[1, if 2006Q3 to 2007Q2]				-0.020	
				(0.016)	
$CLTV_{t-1}$					0.000
					(0.000)
$CLTV_{t-1}$ *[1, if 2006Q3 to 2007Q2]					0.000
					(0.000)
$MissCLTV_{t-1}$					-0.004***
					(0.001)
$MissCLTV_{t-1}$ *[1, if 2006Q3 to 2007Q2]					-0.001
					(0.003)
Dummy [1, if a deal was issued during 2006Q3 to 2007Q2]	-0.005	0.014***	0.008***	0.032**	0.001
	(0.003)	(0.003)	(0.003)	(0.015)	(0.010)
$Issue\ Balance_t$	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Issue\ Balance_t$ *[1, if 2006Q3 to 2007Q2]	-0.000*	-0.000**	-0.000***	-0.000	-0.000**

	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	0.127***	0.101***	0.103***	0.125***	0.105***
	(0.035)	(0.033)	(0.033)	(0.033)	(0.034)
Observations	1,456	1,456	1,456	1,456	1,456
Adjusted R^2	0.798	0.793	0.793	0.796	0.795
Time Fixed	Yes	Yes	Yes	Yes	Yes
BHC Fixed	Yes	Yes	Yes	Yes	Yes
Control Variables	Yes	Yes	Yes	Yes	Yes

Notes: In this table, we rerun the regressions of institutional ownership on various deal quality measures and control variables for grey institutions and independent institutions separately. Deal quality measures are from BBx Data. We find each deal's prospectus in Edgar and identify the deals whose issuers are our sample bank holding companies. FICO is the average FICO score for all mortgages in one deal; DOC is the average documentation level for all loans in one deal; CLTV is the average combined loan-to-value for all mortgages in one deal; LSEC is the proportion of prime mortgages in the deal; Owner is the proportion of owner-occupied properties in the deal. For some deals, FICO information is missing, when this happens, we assign a value of 0 to such deals' FICOs and also create a dummy variable (MissFICO), which takes value of one for deals missing FICO and zero otherwise. For some deals, CLTV information is missing, in this case, we assign a value of 100 to these deals' CLTVs and also create a dummy variable (MissCLTV), which takes value of one for deals with no CLTV and zero otherwise. In Panel A, we examine the ownership of grey institutions; and in Panel B, we examine the ownership of independent institutions. We include time-fixed and BHC-fixed effects to control for non-observable heterogeneities among BHCs and different years. To save space, we do not report the coefficients on control variables. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

Appendix H. Pre-Crisis Institutional Trading and Stock Return around Lehman Brothers Bankruptcy: Banks and Insurance Companies

Panel A. Abnormal returns around Lehman Bankruptcy (-1 day, +1 day)						
	(1)	(2)	(3)	(4)	(5)	(6)
		Banks			Insurance compsnies	
VARIABLES	SCT_MGG	SCT_ALL	PMBS	SCT_MGG	SCT_ALL	PMBS
$SCT_{precrisis}$	0.031	0.035	0.136*	-0.001	0.041*	0.122**
	(0.066)	(0.025)	(0.072)	(0.034)	(0.023)	(0.052)
CHGIO_2006Q3	-0.002	-0.002	-0.007*	0.010	0.009	0.005
	(0.004)	(0.004)	(0.004)	(0.008)	(0.008)	(0.010)
CHGIO_2006Q4	0.014***	0.014***	0.016***	0.007	0.014*	0.013
	(0.003)	(0.003)	(0.004)	(0.008)	(0.008)	(0.008)
CHGIO_2007Q1	-0.002	-0.003	-0.005	0.001	0.004	0.006
	(0.003)	(0.003)	(0.004)	(0.008)	(0.008)	(0.008)
CHGIO_2007Q2	0.005**	0.005**	0.005**	0.009	0.009	0.005
	(0.002)	(0.002)	(0.002)	(0.006)	(0.006)	(0.005)
$SCT_{precrisis}$ * CHGIO_2006Q3	-0.020	-0.037**	0.090*	0.057***	0.033*	0.094
	(0.048)	(0.016)	(0.046)	(0.013)	(0.017)	(0.065)
$SCT_{precrisis}$* CHGIO_2006Q4	0.017	0.012	-0.019	0.115***	0.002	0.051
	(0.028)	(0.019)	(0.047)	(0.039)	(0.034)	(0.070)
$SCT_{precrisis}$* CHGIO_2007Q1	0.029	0.036**	0.072*	0.052*	0.007	-0.003
	(0.051)	(0.015)	(0.037)	(0.031)	(0.020)	(0.071)
$SCT_{precrisis}$* CHGIO_2007Q2	0.013	0.009	0.008	-0.001	-0.009	0.098*
	(0.015)	(0.006)	(0.039)	(0.014)	(0.013)	(0.051)
Constant	0.025***	0.024***	0.021***	0.035***	0.035***	0.032***

	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)	(0.004)
Observations	327	327	327	327	327	327
Adjusted R^2	0.132	0.144	0.142	0.037	0.037	0.039

Panel B. Post-Lehman Bankruptcy long run performance (0, +12 months)

	(1)	(2)	(3)	(1)	(2)	(3)
		Banks			Insurance companies	
VARIABLES	SCT_MGG	SCT_ALL	PMBS	SCT_MGG	SCT_ALL	PMBS
$SCT_{precrisis}$	-0.434	-0.672***	-0.148	-0.891***	-0.551***	-0.639
	(0.693)	(0.259)	(0.658)	(0.307)	(0.145)	(0.487)
CHGIO_2006Q3	0.030	0.029	0.004	-0.155	-0.152	-0.187
	(0.027)	(0.027)	(0.040)	(0.126)	(0.126)	(0.157)
CHGIO_2006Q4	-0.041	-0.041	-0.024	-0.048	-0.034	-0.065
	(0.052)	(0.052)	(0.061)	(0.090)	(0.083)	(0.080)
CHGIO_2007Q1	0.085	0.087	0.094*	-0.128	-0.124	-0.160**
	(0.053)	(0.053)	(0.057)	(0.081)	(0.080)	(0.080)
CHGIO_2007Q2	-0.041	-0.043	-0.048	-0.095*	-0.093	-0.109**
	(0.031)	(0.031)	(0.032)	(0.057)	(0.056)	(0.045)
$SCT_{precrisis}$ * CHGIO_2006Q3	-0.544	-0.217	0.426	-0.089	-0.152	0.421
	(0.562)	(0.375)	(0.414)	(0.227)	(0.182)	(0.863)
$SCT_{precrisis}$* CHGIO_2006Q4	0.122	0.317	-0.416	-0.125	-0.533**	0.359
	(0.470)	(0.319)	(0.535)	(0.542)	(0.230)	(0.602)
$SCT_{precrisis}$* CHGIO_2007Q1	0.227	0.125	-0.210	0.835***	0.537***	1.389**
	(0.373)	(0.173)	(0.368)	(0.271)	(0.098)	(0.542)
$SCT_{precrisis}$* CHGIO_2007Q2	-0.042	0.079	0.201	0.319*	0.238*	0.803**
	(0.259)	(0.146)	(0.333)	(0.165)	(0.141)	(0.378)
Constant	0.103*	0.105*	0.098	0.055	0.057	0.070

	(0.054)	(0.054)	(0.062)	(0.049)	(0.049)	(0.054)
Observations	327	327	327	327	327	327
Adjusted R^2	0.052	0.052	0.051	0.036	0.034	0.032

Appendix I. Pre-crisis Institutional Trading and BHC Operating Performance during Crisis: Banks and Insurance Companies

VARIABLES	(1) Banks	(2) Insurance companies
$PMBS_{precrisis}$	36.822***	32.398***
	(11.325)	(10.781)
CHGIO_2006Q3	-0.905***	0.013
	(0.345)	(1.027)
CHGIO_2006Q4	-0.066	0.997*
	(0.379)	(0.599)
CHGIO_2007Q1	-0.854**	0.619
	(0.388)	(0.702)
CHGIO_2007Q2	-0.037	-0.017
	(0.216)	(0.585)
$PMBS_{precrisis}$ ∗CHGIO_2006Q3	9.791*	8.059
	(5.283)	(8.855)
$PMBS_{precrisis}$ ∗CHGIO_2006Q4	-4.589	-5.098
	(4.787)	(11.396)
$PMBS_{precrisis}$ ∗CHGIO_2007Q1	10.732***	2.708
	(3.786)	(13.007)
$PMBS_{precrisis}$ ∗CHGIO_2007Q2	8.743**	7.046
	(4.262)	(10.764)
Constant	0.432	0.545
	(0.408)	(0.359)
Observations	396	396
Adjusted R^2	0.351	0.304

Notes: This table reports the regression results of cumulative ROA during the crisis on institutional trading over the four quarters leading to the crisis. The cumulative ROA is calculated as the sum of net income over the crisis period divided by the average size of the BHC during the same period. In the regressions, we also include the interaction terms of institutional trading with private-label MBS (PMBS) from the pre-crisis period. In order to capture potential future losses related to the crisis, we use a longer period from the third quarter of 2007 to the second quarter of 2009. The results using two different crisis definitions are reported in the first two columns and last two columns, respectively. We cluster standard error at BHC level to allow for intragroup correlation. *** p<0.01, ** p<0.05, * p<0.1.

Vita

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